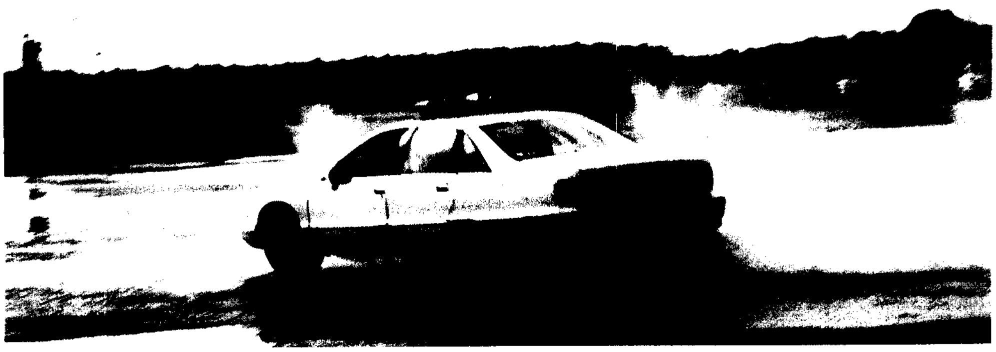
Environmental Acoustic Assessment

for the

Proposed Federal Law Enforcement Training Center

Cheltenham, Maryland



for:

Clark-Nexsen Architects and Engineers, Inc.
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December 14, 2001

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INTRODUCTION

This report contains the Environmental Acoustic Assessment for the Proposed Federal Law Enforcement Training Center (FLETC) in Cheltenham, Maryland. Siebein Associates, Inc. was engaged to assess the acoustic impact of the FLETC's planned training facilities on the Cheltenham environment. Acoustical measurements of existing noise levels were recorded at 45 sites throughout the proposed site and in the surrounding community at distances of up to 1 mile from the proposed site over a ten day period in early September, 2001. Measurements of law enforcement training at indoor firing ranges and at the driving ranges at the FLETC facility in Brunswick, Georgia were recorded in mid-August, 2001. The data from the actual training activities at the Brunswick site were used in a computer model to estimate sound levels at locations around the Cheltenham site as affected by distance, topography and vegetation. The estimated sound levels of these activities are presented, compliance with the noise ordinance requirements is documented and strategies to minimize annoyance from peak sounds of the driving activities beyond that required by the ordinance sound level limits are presented.

This report contains a discussion of the measurement procedure; an interpretation of the sound levels recorded during the site visits; presentation of noise levels of specific law enforcement training events proposed for the Cheltenham site; and preliminary recommendations to minimize the acoustical impact of driver training events on the surrounding neighborhoods.

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EXECUTIVE SUMMARY

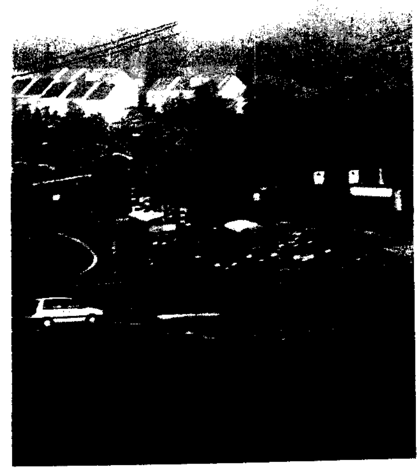
Siebein Associates, Inc. performed acoustical measurements at locations around the proposed FLETC site in Cheltenham, Maryland and of training events at the existing FLETC facility in Brunswick, Georgia. The data from the training activities at the Brunswick site were used in computer models to assess the acoustic impact of the FLETC's planned training facilities on the Cheltenham environment. The results of the computer model study were compared to both existing noise levels recorded in the community during a 9 day time period in September, 2001 and to the requirements of the Prince George's County Noise Ordinance. The major findings of the study are listed below.

1. Average sound levels from indoor firing ranges will not be audible within 500 feet of the range building if the ranges are constructed in a manner similar to the existing indoor firing ranges at FLETC Brunswick. Therefore, there will be no noise impact on surrounding properties based on the proposed siting of the firing range.

2. Average sound levels produced by driver training exercises on the ranges at locations as shown in the FLETC Cheltenham proposed site plan will be less than the 65 dBA daytime sound level limit at the property line required by the Prince George's County Noise Ordinance and the State of Maryland Title 26 Department of the Environment, Subtitle 02 Occupational, Industrial and Residential Hazards, Chapter 03 Control of Noise Pollution.

THE SOUNDS OF CHELTENHAM

The ambient noise levels in a community are a result of complex interactions of multiple noise sources with different frequency (or pitch) components that occur for varying periods of time from all of the activities that occur in a suburban area. How these sounds combine over the course of a day to determine the ambient noise level and what the relative contribution of each noise source is to the total overall level is a complex undertaking.



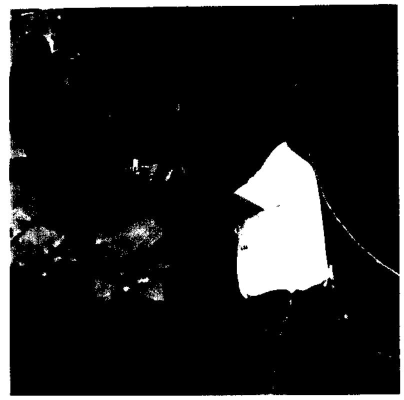
As Cheltenham and the surrounding towns and villages have grown, the variety of sounds that bring life to the town has increased as well. The ambient noise is comprised of the sounds of a growing suburban community. Planes are frequently heard flying overhead. The jet aircraft from Andrews Air Force Base are particularly noticed as they boom across the sky often times unseen in the clouds. Automotive traffic on the main roads such as Route 5, US 301, and secondary roads such as Surratts Road is constantly heard in the background. As the weather heats up, air conditioning units in neighbors yards come on. A stereo or a television set playing in a nearby house is heard as the children arrive home from school at the end of the day. People talking in the street is interrupted by the sound of an ambulance in the distance. The sounds from construction on the many new homes being built in the area such as the pounding of hammers on nails and earth moving equipment is heard throughout many neighborhoods.

Many people in the neighborhoods around Cheltenham work during the day. There are few sounds within the residential neighborhoods other than traffic on roads in the distance, birds chirping, planes flying overhead, construction and delivery trucks during day time hours.

In the afternoons and weekends the neighborhoods come alive. Children play basketball in the streets, teens listen to a boom box down the block, birds chirp in the trees overhead, breezes blow through the trees, insects croak loudly in the night and evening hours, people drive home from work and run errands on busy roads and homeowners move into their yards to cut the grass, build a deck or play with their children. It is interesting to note that the sounds of the insects are louder than the 55 dBA night time sound level limit at most locations.

METHOD

The method for the Environmental Acoustic Assessment consists of the items listed below.



1. Take long term average sound level measurements at locations around the proposed FLETC Cheltenham site to determine the character and magnitude of existing sounds in the community.

2. Take short term average sound level measurements of specific acoustic events at locations around the proposed FLETC Cheltenham site to document the loudness and frequency content or pitch of the combinations of sounds that characterize the sonic environment in the neighborhoods surrounding the site.

3. Take acoustical measurements of training activities that will occur at the FLETC Cheltenham site at the existing FLETC in Brunswick, Georgia to document the loudness of proposed activities.

4. Construct computer models of the Cheltenham site. The source data for training activities obtained at FLETC Brunswick was used for each of the training activities. The training activities were located on the plan of the Cheltenham site. The distances, topography and vegetative cover between the proposed activities and the property lines of the site were applied to the source data from the Brunswick site to estimate resulting noise levels at the property lines at Cheltenham and at locations in the community where sound level measurements were made.

5. The results of the computer model studies were compared with the existing sound levels in the community and with the requirements of the noise ordinance to determine if any acoustic impacts are likely to occur from training activities at the proposed FLETC Cheltenham site.

6. Computer models of methods to reduce noise propagated from the training activities were developed to provide recommendations for minimizing the acoustic impact of the facility.

THE MEASUREMENT TIMES

Acoustical measurements were made by the Consultants from August 27 to September 6, 2001. The dates were selected by FLETC staff as a time when representative activities in the neighborhoods surrounding the site could be observed and measured.

Two basic types of acoustical measurements were taken in Cheltenham: short term sound levels of specific acoustic events and long term average sound levels of all events that occurred at selected site. The specifics of each method are described below.

THE MEASUREMENT SITES

Forty five locations were selected for the short term acoustical measurements of specific events in and around the proposed FLETC site in Cheltenham, Maryland. The sites were selected to represent the acoustical conditions in the neighborhoods that are located near the proposed facility. Sites included areas near main traffic arteries such as Woodyard Road (223); Route 5 and Route 301; near secondary roads such as Surratts Road and Frank Tippetts Road; quiet locations within the residential subdivisions that surround the proposed site; and areas away from major sources of noise such as the woods at the end of Poplar Hill Drive. The measurement sites were selected in three groups located at increasing distance from the proposed facility.

1. Locations near the boundaries of the proposed site on all sides.

2. Locations within ½ mile of the proposed site on all sides.

3. Locations between ½ mile and 1 mile of the proposed site on the west, south and east sides of the site where there is less of a natural buffer between homes and the proposed facility.

Individual descriptions of each measurement location, along with their corresponding numerical designations shown in Figure 1 are listed below.

DESCRIPTIONS OF MEASUREMENT LOCATIONS

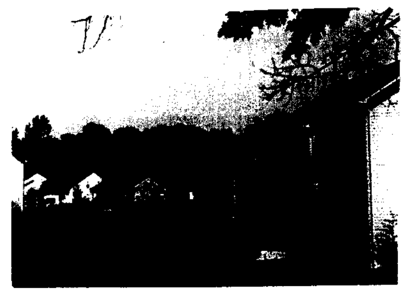
M1   M1 was located in the cul-de-sac at the end of Poplar Hill Drive in the Poplar Hill Estates neighborhood. This is the closest residential location to the proposed facility that is not located near a busy road.

M2 M2 was located at the intersection of Holly Lane and Poplar Drive in the Poplar Hill Estates residential neighborhood.

M3 M3 was located on Commo Road opposite the lst house in the Tippetts Estates neighborhood that is being built on the north side of the road.

M4 M4 was located at the intersection of Frank Tippetts Road and Commo Road. Frank Tippetts Road is a fairly busy secondary street with a variety of automobile and commercial traffic.

M5 M5 was located just off Dangerfield Road where the 90° bend in the road occurs. The proposed FLETC property fence adjoins the right-of-way for the road at this location.



M6 M6 was located at the north gate to the proposed FLETC property on Commo Road (Redman Avenue).

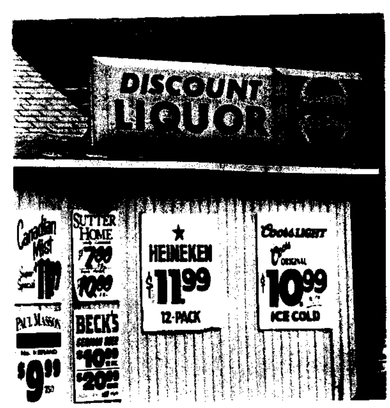
M7 M7 was located at the cul-de-sac at the end of Allerton Terrace in the Crotona Park residential neighborhood that adjoins the proposed FLETC property on the north.

M8 M8 was located at the end of Helmsley Drive .

M9 M9 was located in the parking lot of the RICA Center to the south of the site.

M10 M10 was located at the intersection of Dangerfield Road and Commo Road on the north side of the site.

M11 M11 was located at the side of Commo Road in front of the Fire Training Facility.



M12 M12 was located at the intersection of Surratts Road and Frank Tippetts Road.

M13 M13 was located at the intersection of Frank Tippetts Road and U.S. 301 (in the parking lot of the liquor store).

M14 M14 was located at the edge of the woods in a vacant lot on Angora Drive in the Tippetts Estates neighborhood.

M15 M15 was located at the corner of Spinnaker and Angora in the Tippetts Estates neighborhood.

M16 M16 was located in the Terrace Acres neighborhood at the end of Marlboro near the intersection with Garden Valley.

M17 M17 was located ½ a block in from Frank Tippetts Road on Courtland near the intersection with Rock Oak.

M18 M18 was located at the intersection of Farrar Avenue and Farrar Court in Rolling Acres.

M19 M19 was located at the north end of Le Fevre Drive just past the intersection of Angora Court in Rolling Acres.

M20 M20 was located on Hospital Drive ½ block north of Abelia Drive.

M21 M21 was located at Fox Run and Huntsman in Fox Run Estates.

M22 M22 was located at Foxcroft and Milligan in Surratt Manor.

M23 M23 was located at the intersection of Simson Lane and Milligan. There is a clear view through the trees at the end of Milligan to Route 5 from this location.

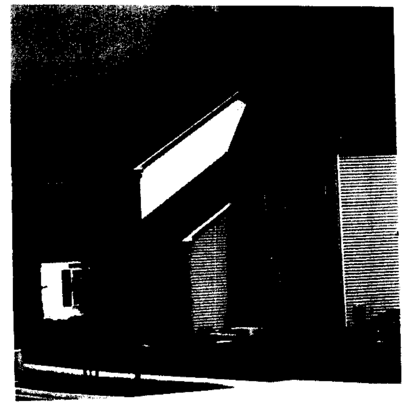
M24 M24 was located at the intersection of Route 5 and Woodyard Road (Route 223). Two locations were used here: one in the parking lot of the fast food restaurant on the north side of Woodyard and a second in the parking lot of the bakery on the south side of Woodyard.

M25 M25 was located ½ block from Woodyard on Canberra Drive in the Clinton Vista neighborhood.

M26 M26 was located at the intersection of Canberra Drive and Royal Fern Court in the Fox Run North neighborhood.

M27 M27 was located at the intersection of Goldfield Place and Drawbridge Court in the Fox Run Estates neighborhood.

M27A was located ½ a block farther up Drawbridge where a lawn crew was working in a yard.



M28 M28 was located at the corner of Drum Point and Fox Park Court in Fox Run Estates.

M29 M29 was located at the intersection of Edison Lane and Linhurst Drive in Crotona Park.

M30 M30 was located in the parking lot of the 7-11 convenience store at the intersection of Surratts Road and Route 5.

M31 M31 was located at the entry to the nursing home near the intersection of Surratts Road and Dangerfield Road.

M32 M32 was located at the end of the gravel road that approaches the electric substation off Surratts Road.

M33 M33 was located at the top of the hill on Summit Drive in the Summit Creek neighborhood.

M34 M34 was located at the intersection of Serenade Lane and Serenade Court in the Cedar Pointe neighborhood.

M35 M35 was located at the top of the berm on Quiet Brook Lane in the Oak Orchard neighborhood. This site overlooks Route 5.

M36 M36 is located at the intersection of Raintree Way and Dewdrop Way in the Summit Creek neighborhood.

M37 M37 was located at the intersection of Stuart Lane and Black Willow Court in the Oak Orchard neighborhood.

M38 M38 was located on the hill outside the Colony Hotel overlooking Surratts Road a short distance from the intersection with Route 5.

M39 M39 was located at the intersection of Surratts Road and Route 5. Measurements were taken on the west side of Route 5.

M40 M40 was located at the end of Sarah Landing Drive in the Camden Estates neighborhood.

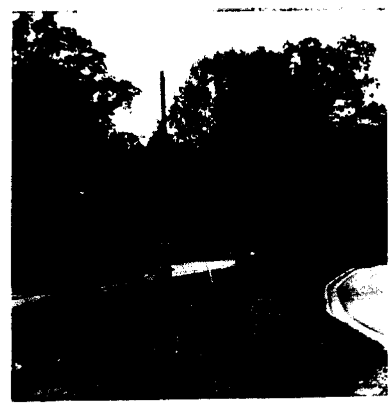
M41 M41 was located at the intersection of Saddlebow Drive and Auburn Hill Drive in the Summit Creek neighborhood.

M42 M42 was located at the entrance to the Summit Creek neighborhood at the intersection of Saddlebow Drive and Surratts Road.

M43 M43 was located at the big log on the south side of Surratts Road east of the intersection with Beverly Avenue.

M44 M44 was located at the intersection of Surratts Road and Poplar Hill Road.

M45 M45 was located at the grassy area off Surratts Road at the entrance to the Southern Maryland Medical Center.



The long term measurements of average sound levels in the community were made at 12 sites: including M1, M4, M5, M6, M8, M14, M28, M30, M31, M35, M40 and M41 for a minimum of 3 days at each site.

A circuit of the 45 locations described above was made at approximately 4 hour intervals during the day and night. Data were specifically recorded during morning, afternoon, early evening, late night and early morning hours to obtain an acoustical profile of the sound levels and activities that occur and how they change throughout the day and night. The same procedure was followed on each of the measurement trips.

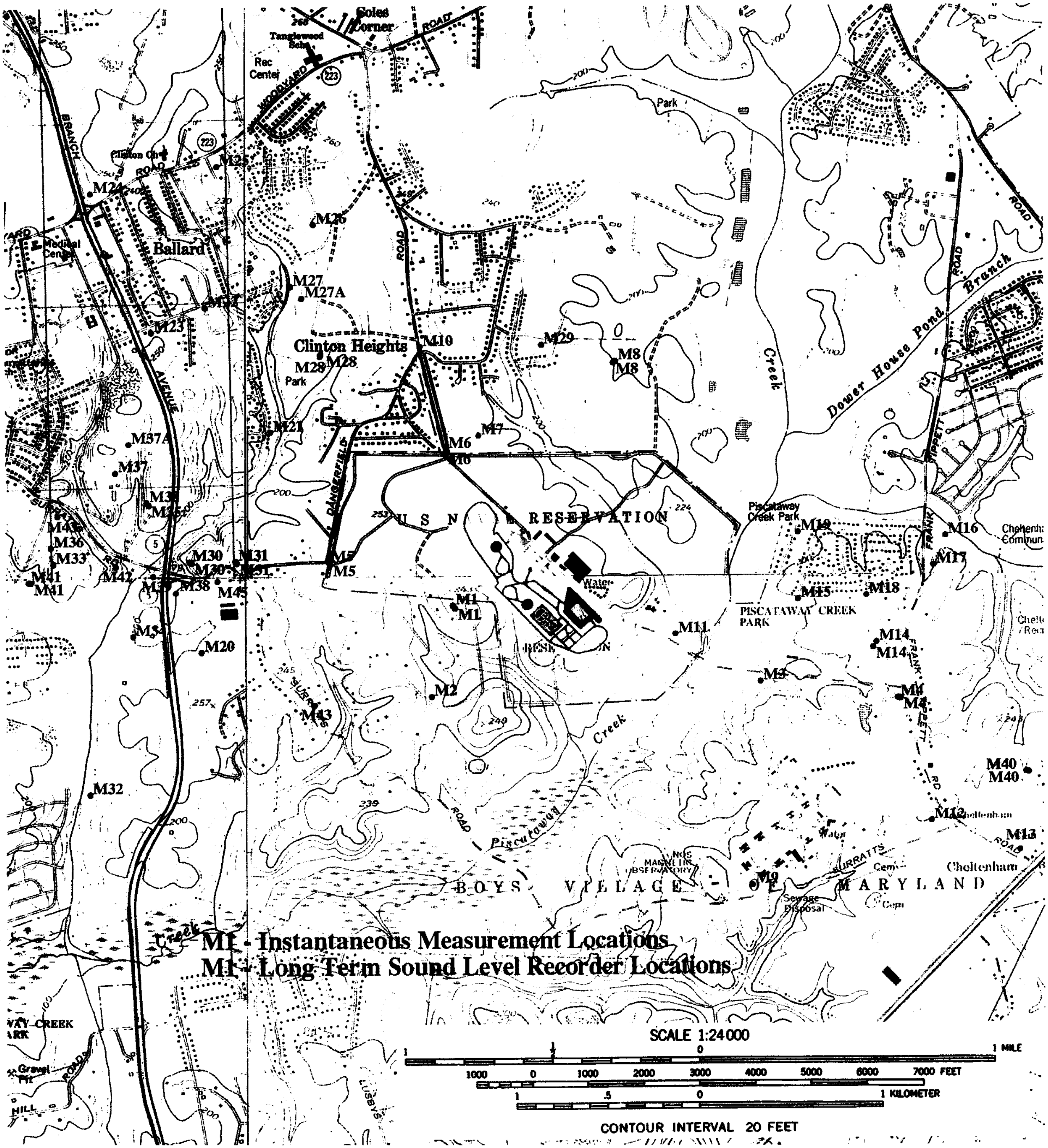


Figure 1. Site plan illustrating measurement locations.

INSTRUMENTATION

Three types of acoustical measurements were made during this study. These are described below.

1. **Long term measurements of average sound levels in the community.** Long term measurements of average sound levels in the community were made with 4 Rion NL-06 integrating sound level meters. The Rion equipment meets ANSI requirements for a type II sound level meter. The meter was set to the fast, A-weighted mode to acquire data. The equipment was calibrated with a pistonphone prior to and after testing. The microphone was covered with a wind screen and positioned atop an extension rod approximately 5 ft 6 inches (the height of a standing person) above ground and the environmental case strapped to a tree or fence as was available at each site. The meters were placed in secure weather proof boxes at locations M1, M4, M5, M6, M8, M14, M28, M35, M40 and M41 for at least 3 days to record sound levels every 1 second. The 1 second levels were averaged over a 1 minute time period to yield a 1 minute Continuous Equivalent Sound Level (Leq). Graphs illustrating the 1 minute continuous equivalent sound level (Leq) plotted vs. time for each 3 day time period are shown in Appendix D. Data were downloaded from the meters to a memory card that could enter the data into a spreadsheet in a laptop computer after the measurement time.

   The sound level meter also recorded A-weighted maximum and minimum sound levels, as well as other statistical acoustic data (L05, L10, L50, L90 L95 and SEL). These data are available for review if required. The L05 is the sound level exceeded for 5% of the measurement time. The L10 is the sound level exceeded for 10% of the measurement time. The L50, L90 and L95 are defined similarly for 50%, 90% and 95% of the measurement time respectively. The SEL is the sound exposure level.

2. **Short term measurements of specific acoustic events.** Two Ivie PC-40 Real Time Analyzers were used as the basic instrumentation. These are computer-based analyzers that can record overall, octave and one-third octave band sound pressure levels over user programmed periods of time. They meet ANSI standards for Type 1 sound level meters. Calibration of the PC-40s with a Brüel and Kjær pistonphone occurred approximately every 4 hours during testing periods. The microphones were held at the location of the ears of a typical person who is standing, approximately 5.5 feet from the ground. A windscreen was attached to the microphones for all measurements. Overall A-weighted average and peak accumulative sound levels and 1/3 octave band spectra of significant acoustic events were recorded at all locations. The data were downloaded from the PC-40 to desktop computers in our laboratory where the data were analyzed.

   Qualitative observations of type and character of sounds were noted by the Consultants during the measurement process. A tabular summary of A-weighted sound levels recorded at eachlocation with qualitative descriptions of particular acoustic events are included in Appendices A and C.

   An A-weighted sound level is one to which an A- weighting filter has been applied. The A-weighting filter approximates the response of the human ear to lower and medium frequency pure tone sounds. It deducts significant amounts of sound energy from the low frequencies.

   An octave band is a group of frequencies where the highest frequency is twice the lowest frequency. For example, the octave band centered at 250 Hz, which is approximately middle C on a piano, would span from 177 Hz to 355 Hz, a doubling of frequency. A one-third octave band is a group of frequencies that is only one third of an octave wide. The one-third octave band centered at 250 Hz would span from 224 Hz to 282 Hz. Octave band or one-third octave band sound level measurements provide the most precise way to measure sounds to describe not only their loudness, but also their pitch. It is possible to present graphs showing several sounds compared to the ambient in a way that demonstrates why sounds with similar overall levels can be heard as different from one another due to the differences in the frequency content or pitch of the sounds.

The periods of time over which sounds are averaged as the levels are recorded is an important variable to consider when sounds of short duration are of interest. Short term sounds such as the acceleration, or rapid stopping of automobiles and gunshots are transient sounds. A short duration, transient sound is followed by a brief period of quiet, then a second sound is heard, then another period of quiet occurs, and so on. The loudness of the transient sound is averaged with the period of quiet between the sounds in typical acoustical measurements. Typical sound level meters will record sound levels of short duration sounds at 10-20 dB less than the true peak level of the sound. Therefore when recording the rapid stopping of automobiles or gunshots, a peak setting on the sound level meter can be used to record the instantaneous highest sound level (or peak level) that is reached.

3. **Acoustical experiments at the FLETC facility in Brunswick, Georgia.** Short term acoustical measurements of specific acoustical events were also made at the FLETC facility in Brunswick Georgia of training events that will occur at the proposed Cheltenham facility using the methods described above and the Ivie PC-40 real time analyzers. The specific experiments are described in Appendix B. They included measurements of firearms training in the existing indoor ranges at FLETC Brunswick and measurements of training sessions at the Driver Training Facility at the Emergency Response Range (Range 7), the Non-Emergency Vehicle Operation Track (NEVO), the Urban Response Range (Range 9), and the Skid Pads (Ranges 4 and 5). These data were used in computer models of sound propagation into the community at the Cheltenham site to determine sound levels at the ste boundaries that will be produced by the firearms and driver training activities.

PRINCE GEORGE'S COUNTY NOISE ORDINANCE

Prince George's County uses the State of Maryland Title 26 Department of the Environment, Subtitle 02 Occupational, Industrial and Residential Hazards, Chapter 03 Control of Noise from the Annotated Code of Maryland as its Noise Ordinance. This ordinance requires sound produced on an industrial or commercial property to be less than or equal to 65 dBA when it enters a residential property during the day time hours. The day time hours are defined as extending form 7 am until 10 pm. Sound levels propagated onto a residential property must be less than or equal to 55 dBA during the night time hours.

There are a number of sound sources that are exempt from the provisions of the ordinance. These include the items listed below among others.

1. Motor vehicles on public roads
2. Agricultural and field machinery
3. Airplanes
4. Rapid transit
5. Lawn care and snow removal equipment

6. Household tools and portable appliances
7. Construction work
8. Residential air conditioning equipment

The point of enforcement is defined as the receiving property line or points within the receiving property. Measuring equipment must meet or exceed specifications for Type II sound level meters.

Section 02, Environmental Noise Standards, B.2 state that a Day-Night Average Sound Level (L_{DN}) of 55 dBA is a standard for the state to be achieved on residential properties. None of the existing L_{DN}'s measured reached these levels. The existing L_{DN}'s varied from 66-71 dBA. When the 10 dB night time penalty was not added to the sounds measured form 10 pm until 7 am as an attempt to compensate for the effects of insect noise at night, the L_{DN}'s varied from 50-66 dBA.

COMPUTER MODELS

Computer models for each of the training activities were constructed to use the source data from actual training events at FLETC Brunswick and adjust it for the distances, topography, vegetation and limitation due to sky reflections that occur at the Cheltenham site. The field measured sound levels of the actual training activities at FLETC Brunswick are presented in Appendix A and described in detail in Appendix B. The loudest sounds for each training activity were used as the source sound in the computer models so the models represent the loudest sounds that will occur at the modeled locations.

Sound levels were initially estimated at increasing distances for each of the training activities to get a general idea as to what distance the activities could be located from the property line and not violate the noise ordinance requirements. Average sound levels for all activities were reduced to less than 65 dBA within 250 ft to 500 ft of the source.

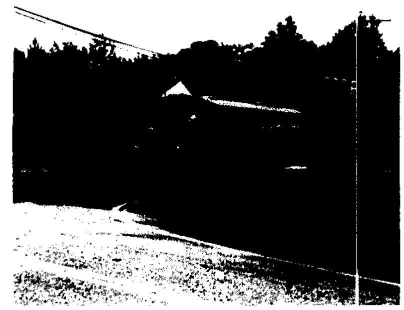
Peak sound levels from cornering vehicles at high speeds, braking, and skid pad training will be below 65 dBA at distances of 2500 ft. and greater. It is important to note that while people may hear the peak sound levels above the ambient sounds in the community, the noise ordinance does not require measurement of the peak sounds nor does it require peak sound levels to meet the noise ordinance sound level limits.

The effects of topography, vegetative cover and limitations of sound reduction due to sky reflection were added to the computer models for specific locations including 6 locations along the boundaries of the site and the 12 locations where long term average acoustical measurements were made. Estimated average and peak sound levels are shown overlaid on the sound level vs. time plots for each of the long term measuring locations in Appendix D.

RESULTS

DISCUSSION OF THE LONG TERM ACOUSTIC MEASUREMENTS

Graphs of sound level vs. time for each of the long term measurement locations are included in Appendix D. A segment of the sound level vs time graph for location M1 is shown in figure 2. The curved lines with the sharp vertical "spikes" represent the actual measured sound levels at the site. The zig-zag vertical lines across the bottom of the graph indicate the computer model estimate of average sound levels produced by the combination of training activities on the proposed FLETC site at this location. The dashed horizontal lines indicate the extent of short term, instantaneous peak sound levels from rapid braking, tires squealing around curves and other noises associated with driver training as described in Appendix B.



Night time sound levels at all locations are characterized by a relatively continuous sound level (i.e. almost horizontal line on the graph) dominated by insects. In areas away from major traffic arteries, insect sounds at night were actually louder than most of the ambient sounds during the day time. Typical sound levels from insects varied from 50-60 dBA at M1, M6, M8, M28, M40 and M41. Insect sound levels were between 45-50 dBA at M14.

The sound levels during the day time hours are characterized by lower sound levels than the night time hours and a series of "spikes" that rise above the ambient sounds. Daytime sounds were dominated by traffic on major roads such as Surratts Road, Frank Tippetts Road and Route 5 at locations M4, M5, M6, M35 and M41. The tall spikes noted during daytime areas are planes flying overhead. These sounds vary from 57 to 92 dBA. They are heard as significant acoustic intrusions in the sonic environment. The planes are easily identified because the sounds are recorded at all measuring locations within a short time period of each other.

Other spikes occur when heavy automobile traffic, garbage trucks, delivery trucks and school buses pass. They also occur when lawn maintenance equipment, construction activities or wood chippers are used. The spikes from these activities will only occur at one location and are of lower amplitude than the planes.

It appears as though many families in the neighborhoods around the site have 2 working parents with children in school during the day. During the normal working hours there is not much noise produced by activities within the neighborhoods except light, local traffic.

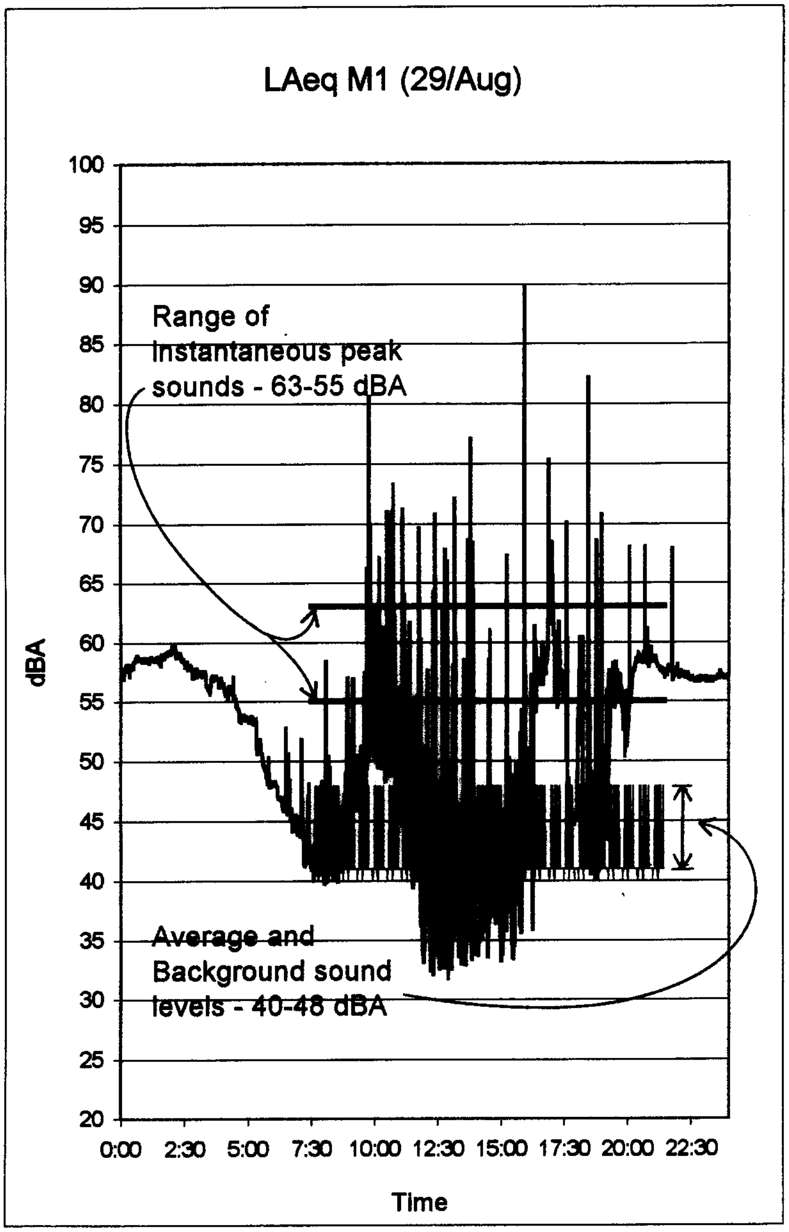


Figure 2. Segment of long term sound level vs. time graph recorded at M1.

DAY NIGHT AVERAGE SOUND LEVELS

Day night average sound levels were calculated for each of the long term measurement locations. The day night average sound level (L_{DN}) is the average of the sound levels in each hour of the day with a 10 dB penalty added to sounds that occur during the night time hours (10 pm until 7 am). There were elevated noise levels during the night time and evening hours at most measurement locations from insects. The L_{DN} was calculated in two ways. First with the measured data as is, adding the 10 dB night time penalty to the sounds as required. Second, the L_{DN} was calculated without adding the 10 dB penalty to night time sounds assuming that during the winter months when the crickets were not present, the night time levels would be reduced by that amount.

Table 1. Day-Night Average Sound Levels.

Location No.	Description of location	Existing L_{DN} (dBA)	
		insects	no insects
M1	The cul-de-sac at the end of Poplar Hill Drive	65	62
M4	The intersection of Frank Tippetts Road and Commo Road	64	59
M5	The 90° bend in Dangerfield Road	63	62
M6	The north gate to the proposed FLETC property on Commo Road (Redman Avenue).	66	64
M8	The end of Helmsley Drive	66	64
M14	The edge of the woods in a vacant lot on Angora Drive in Tippetts Estates neighborhood	58	50
M28	In the woods near the park entrance at the corner of Drum Point and Fox Park Court in Fox Run Estates	66	62
M35	The top of the berm on Quiet Brook Lane in the Oak Orchard neighborhood	71	65
M40	The end of Sarah Landing Drive in the Camden Estates neighborhood	59	52
M41	The intersection of Saddlebow Drive and Auburn Hill Drive in the Summit Creek neighborhood	65	57

Generally a change of 3 dB in the L_{DN} is viewed as a threshold for establishing noise impact. Under worst case assumptions for the loudest sound sources operating continuously for the entire day on each track with no breaks, the L_{DN} at M1 increased by approximately 0.6 to 0.9 dB. There will be no change in the existing L_{DN} due to law enforcement training activities on the proposed FLETC site at locations M4, M5, M6, M8, M14, M28, M35, M40 and M41.

ESTIMATED SOUND LEVELS AT THE PROPERTY LINES

The computer models described above were used to estimate the sound levels from each of the training activities at the property lines. Six locations (Test 1 through Test 6) were selected as points of interest along the property lines. The Test locations are shown in figure 2. These points were chosen to provide the closest distances to the loudest training activities. Therefore, they represent the locations with the greatest likelihood of presenting a noise impact. The results of these studies are summarized in Table 2. The effects sound reduction through mid to dense vegetation and shielding by hills were not accounted for in these estimates.

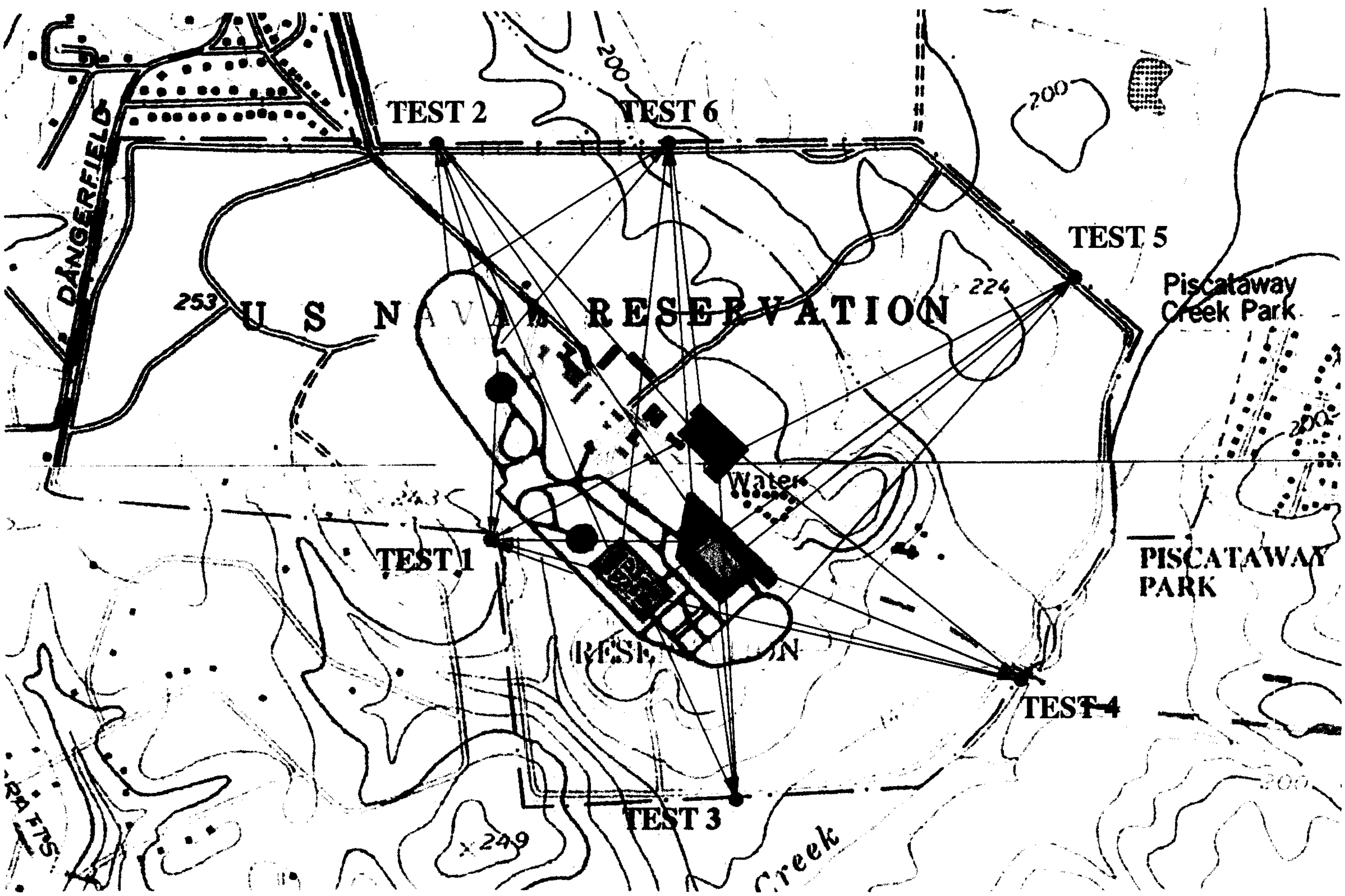


Figure 2. Site plan illustrating sound sources modeled to each test location in the computer model studies.

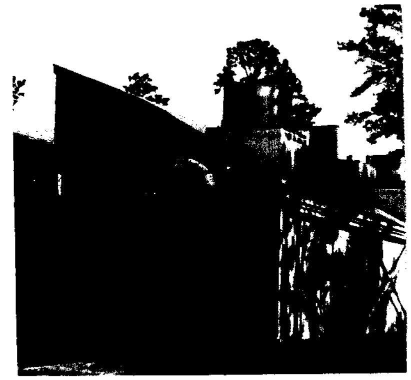
Table 2. Summary of Estimated Sound Levels at the Property Lines for Each Training Activity.

Sound Source	Distance (Feet)	Average sound level (dBA)	Peak sound level (dBA)
Test 1			
ER Range 7 Straight away	250	55	N/A
Corner 3 ER Range 7	250	47	55-66
ER Range 7 curve	259	46-50	63-78
UR Range 9 multiple curves	250	57	76-85
Skid Pad 5	1250	<45	68-69
Skid Pad 4	1250	51	61-64
NEVO Range	875	<45	45-50
Indoor Firing Ranges	1625	<45	<45
Test 2			
Corner 3 ER Range 7	1000	<45	45-51
ER Range 7 curve	1000	<45	49-64
UR Range 9 multiple curves	1000	<45	61-70
Skid Pad 5	3000	<45	55-56
Skid Pad 4	3000	<45	48-58
NEVO Range	3125	<45	<45
Indoor Firing Ranges	2625	<45	<45
Test 3			
Corner 3 ER Range 7	1000	<45	45-51
ER Range 7 curve	1000	<45	49-64
UR Range 9 multiple curves	1000	<45	61-70
Skid Pad 5	1250	<45	68-69
Skid Pad 4	1250	51	61-69
NEVO Range	1125	<45	45-50
Indoor Firing Ranges	2125	<45	<45
Test 4			
Corner 3 ER Range 7	1375	<45	45-50
ER Range 7 curve	1375	<45	45-60

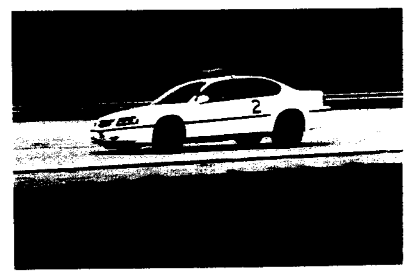
Sound Source	Distance (Feet)	Average sound level (dBA)	Peak sound level (dBA)
UR Range 9 multiple curves	1375	<45	57-66
Skid Pad 5	1625	<45	65-66
Skid Pad 4	1625	48	57-66
NEVO Range	2000	<45	<45
Indoor Firing Ranges	2125	<45	<45
Test 5			
Corner 3 ER Range 7	2750	<45	<45
ER Range 7 curve	2750	<45	45-51
UR Range 9 multiple curves	2750	<45	46-57
Skid Pad 5	2625	<45	57-58
Skid Pad 4	2625	<45	51-60
NEVO Range	3500	<45	<45
Indoor Firing Ranges	2000	<45	<45
Test 6			
Corner 3 ER Range 7	1250	<45	45-49
ER Range 7 curve	1250	<45	46-61
UR Range 9 multiple curves	1250	<45	58-67
Skid Pad 5	2500	<45	58-59
Skid Pad 4	2500	<45	51-60
NEVO Range	2750	<45	<45
Indoor Firing Ranges	1750	<45	<45

The average sound levels from all sources are less than the 65 dBA required in the Prince George's County Noise Ordinance. Instantaneous peak sound levels of short term transient events such as tire squeals, abrupt braking on curves or during skids, etc. are also less than the 65 dBA sound level limit with several exceptions. It is important to note that instantaneous, peak sound levels are not usually required to meet the sound level limits in noise ordinances but may be the basis of annoyance complaints.

At Test 1, sound levels from the high speed curves can be reduced by straightening out the track in the vicinity of the property line so that a straight away is located where the track and the property lines are closest.



By moving the nearest lane of the track to a minimum of 500 ft from the property line and the nearest curves to 750 ft from the property line, these sounds can be reduced significantly. This would also involve smoothing out the sharp turn that is currently located at the 250 ft distance from the property line. The Skid Pad should be located so it is at least 1500 ft from this property line. Additional reductions in sound can be accomplished by maintaining a minimum 250 ft dense vegetative buffer between the track and the property line and by constructing a sound barrier consisting of a berm, wall or berm and wall combination with an absorbent face on the track side within 50 ft of the road bed. The height of the barrier would have to be between 10 and 25 ft above the road bed depending upon the final elevation and location of the road bed.



At Test 2, there is a slight exceedence in the peak sound level for the sharp, high speed turns. This can be reduced by maintaining the nearest edge of the curve at a minimum distance of 1000 feet from the property line and keeping the radii of the curves at this location similar to the large curves at the ends of the Brunswick ER Track 7. Additional sound reductions can be achieved by extending the barrier wall/berm to enclose the north end of the track and maintaining a vegetative buffer along this side of the track as well.

At Test 3, exceedences of peak sound levels from the Skid Pad and sharp turns can be reduced by maintaining the minimum distances of 1000 ft between the track and the property line and by maintaining the vegetative buffer along this side as well. Additional sound reduction can be achieved by constructing the optional barrier/berm along the southern side of the ranges.

At Test 4 the minor exceedences of peak sound levels can be reduced by 250 ft of dense vegetative buffer or by extending the optional barrier/berm combination along this side of the range.

There are no exceedences of peak sound levels at Test 5.

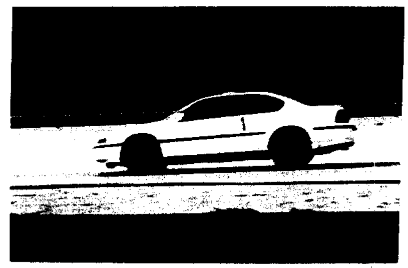
The exceedence of the peak sound levels at Test 6 from the sharp J turn can be reduced by maintaining the vegetative buffer along this side and/or by extending the optional barrier/berm along the northern side of the tracks.

The estimated L_{DN} at the Test 1 location would increase by 0.6 to 0.9 dB if the modeled sounds from all sources are added together and assumed to operate at this level for each hour of the day. The estimated L_{DN} would not be increased at locations Test 2, Test 3, Test 4, Test 5 and Test 6 under the same assumptions.

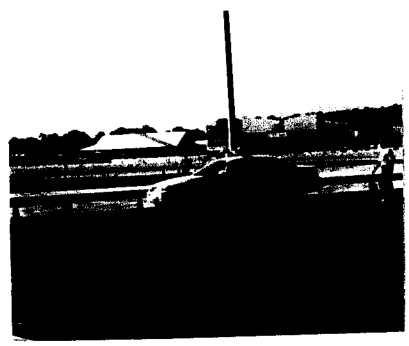
CONCLUSIONS

Conclusions of the Environmental Acoustic Assessment of proposed fire arms and driving training activities at the FLETC Cheltenham site are presented below.

1. Average sound levels from indoor firing ranges will not be audible within 500 feet of the range building if the ranges are constructed in a manner similar to the existing indoor firing ranges at FLETC Brunswick. Therefore, there will be no noise impact on surrounding properties based on the proposed siting of the firing range.



2. Average sound levels produced by driver training exercises on the ranges at locations as shown in the FLETC Cheltenham proposed site plan will be less than the 65 dBA daytime sound level limit at the property line required by the Prince George's County Noise Ordinance and the State of Maryland Title 26 Department of the Environment, Subtitle 02 Occupational, Industrial and Residential Hazards, Chapter 03 Control of Noise Pollution.



3. While the average values described in item 2 represent the measurement method used to determine compliance with the noise ordinance, it is possible for the facility to meet the sound level limits in the ordinance and still be subject to annoyance complaints by citizens. Berms, barriers, distance buffers, vegetative buffers and fine tuning of the range design can help to reduce the risk of annoyance from peak noise levels. These items would also help to account for variations in atmospheric attenuation due to temperature inversions, wind direction shifts and loss of foliage on trees in the winter months.

4. There are 2 limitations on the source data used in the computer model studies contained in this Environmental Assessment. First, measurements of cars with internal sirens were not taken at the Brunswick site because these cars are not available at this time for study. The Consultants recommend simulating this feature at FLETC Brunswick in the near future to verify that the conclusions of this report will be the same for cars using the internal sirens. Second, acceleration of cars going up and down hills was not accounted for in the measured data because the Brunswick site is flat. If there are sharp grades on the tracks at the Cheltenham site, this should be accounted for in our models.

APPENDIX A:

DATA SUMMARY OF ACOUSTICAL MEASUREMENTS OF DRIVER TRAINING AND FIREARMS TRAINING AT FLETC BRUNSWICK

ER M 2	Position / Sound Source	Type	dBA		Avg.
	ER M2 ambient between cars	Ambient	42.7	Fast	42.7
	ER M2 test avg. acc car passes	Average	72.1	Fast	60.9
	ER M2 accelerate trough turn		60.8	Fast	
	ER M2 avg. for 2 cars trough turn		59.5	Fast	
	ER M2 80% moc up car passes avg.		58.9	Fast	
	ER M2 clockwise avg.		58.8	Fast	
	ER M2 avg.		58.3	Fast	
	ER M2 car passes avg.		58	Fast	
	ER Me car passes avg. acc	Average Acc.	71.8	Fast	68.2
	ER M2 2 car passing avg. acc		68.7	Fast	
	ER M2 avg. acc. trough turn		66.5	Fast	
	ER M2 avg. acc. trough turn		65.6	Fast	
	ER M2 p acc. car passes	Peak Acc.	88.6	Peak	84.9
	ER M2 p acc. car passes		81.2	Peak	
ER M 1					
	ER M1 ambient between cars	Ambient	46.8	Fast	46.8
	ER M1 car passes, plane in distance	Average	57.4	Fast	55.7
	ER M1 car passes		56.9	Fast	
	ER M1 car passes, plane in distance		56.7	Fast	
	ER M1 car passes, plane in distance		55.2	Fast	
	ER M1 car passes		54.1	Fast	
	ER M1 car passes		54	Fast	
	Straight way chuck 80% avg.	Average	56.1	Fast	56.1
	Straight way chuck 80% avg. acc.	Average Acc.	67.3	Fast	67.3
	Straight way chuck 80% pk. acc.	Peak Acc.	77.2	Peak	77.2
Range 4					
	Threshold braking avg.	Average	74.6	Fast	68.9
	Hard braking skid avg.		72.2	Fast	
	Hard braking w/ABS avg.		71.4	Fast	
	Hard braking avg.		71	Fast	
	Hard braking avg.		70.9	Fast	
	Hard braking avg.		69	Fast	
	Hard braking avg.		67.1	Fast	
	Hard braking skid avg.		64.6	Fast	
	Hard braking skid avg.		64.3	Fast	
	Hard braking avg.		63.5	Fast	
	Hard braking skid avg. acc.	Average Acc.	81.1	Fast	75.3
	Hard braking w/ABS avg. acc.		78.3	Fast	
	Hard braking avg. acc		71.1	Fast	
	Hard braking avg. acc		70.8	Fast	
	Hard braking pk. acc.	Peak Acc.	90.1	Peak	86.3
	Hard braking pk. acc.		85.3	Peak	
	Hard braking w/ABS pk. acc.		83.4	Peak	
Range 5					
	Range 5 brake acceleration at start	Average	71	Fast	68.4
	Range 5 acceleration		68.7	Fast	
	Range 5 acceleration		65.5	Fast	
	Range 5 avg acc acceleration + skid	Average Acc.	72.5	Fast	72.5
	Range 5 pk acc start + skid	Peak Acc.	88.3	Peak	88.3
	Braking lane	Average	85.1	Fast	74.5

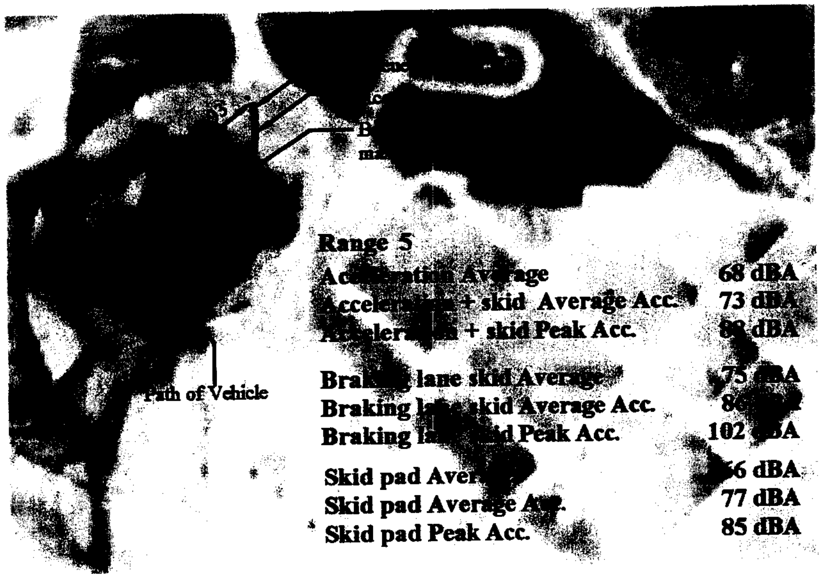
	Avg. backward skid J-turn		73.6	Fast	
Range 5					
	Braking lane skid avg.		73.6	Fast	
	Braking lane skid avg.		70.2	Fast	
	Braking lane backup J-turn avg.		69.9	Fast	
	Braking lane backup J-turn avg. acc.	Average Acc.	95.7	Fast	85.8
	Braking lane skid avg. acc.		83.5	Fast	
	Braking lane J-skid avg. acc.		78.3	Fast	
	Braking lane skid pk. acc.	Peak Acc.	104.5	Peak	101.7
	Braking lane backup J-turn pk. acc.		100.5	Peak	
	Braking lane J-turn BOOTLEG pk. acc.		100	Peak	
Skid pad					
	Skid pad 360 at dry pavement avg	Average	68.4	Fast	66.3
	Ski pad avg. 360 wet skid + acceleration		64.1	Fast	
	Skid pad 6 ft avg. acc. 360 dry skid	Average Acc.	78.9	Fast	77.3
	Skid pad avg. acc. 360 turn + acc.		75.7	Fast	
	Skid pad pk acc. 360 dry skid	Peak Acc.	85	Peak	85.0
NEVO					
	NEVO Range 1 horn beep avg. acc.	Average Acc.	84.2	Fast	84.2
	NEVO Range 2 40 ft avg. for run	Average	72	Fast	61.8
	NEVO Range 2 backup 30ft		57.8	Fast	
	NEVO Range 2 avg. for run 30 ft		55.6	Fast	
	NEVO Range 2 horn beep avg. acc. 50 ft	Average Acc.	54.7	Fast	54.7
	NEVO Range 3 avg. for run	Average	56.5	Fast	56.5
	NEVO Range 3 back up 25 ft to center line of track	Average Acc.	57.2	Fast	57.2
	NEVO 5 atop avg. acc.	Average Acc.	68.9	Fast	67.3
	NEVO 5 car stops 35 ft		65.7	Fast	
	NEVO 5 pk acc. car stops	Peak Acc.	78.7	Peak	78.7
CNR #3					
	Driving course ambient, no cars, radio in distance	Ambient	50.3	Fast	50.3
	CNR#3 car acceleration out of CNR	Average	69.7	Fast	69.7
	CNR#3 car acceleration out of CNR avg. acc.	Average Acc.	78.3	Fast	76.5
	CNR#3 hard acceleration out of CNR avg. acc.		76.7	Fast	
	CNR#3 car acceleration out of CNR avg. acc.		74.6	Fast	
	CNR#3 car hard acceleration out of CNR pk. acc.	Peak Acc.	87	Peak	85.0
	CNR#3 car moderate acceleration out of CNR pk. acc.		82.9	Peak	
Range 9					
	Range 9 p2 avg. trough turn passenger side	Average	70	Fast	68.5
	Range 9 post 2 avg. trough turns		67	Fast	
	Range 9 p2 avg. acc. through 2 turns	Average Acc.	86.3	Fast	86.3
	Range 9 p2 pk. acc. car trough 2 turns	Peak Acc.	95	Peak	95.0
Indoor range					
	Indoor range ambient, propeller plane overhead	Ambient	60.6	Fast	60.6
	Indoor range 12 ft 8 shooters	Average	119.9	Fast	95.9
	Indoor range p/a + vent. system		79.9	Fast	
	Indoor range p/a + vent system		88	Fast	
	Indoor range pk. acc. 12 ft 8 shooters	Peak Acc.	137.7	Peak	139.0
	Indoor range pk. acc. 12 ft 8 shooters		140.2	Peak	
	Indoor range outside vent fan 25 ft	Average	64.8	Fast	64.8
	Indoor range ambient ext. by bullet trap	Ambient	52.3	Fast	52.3

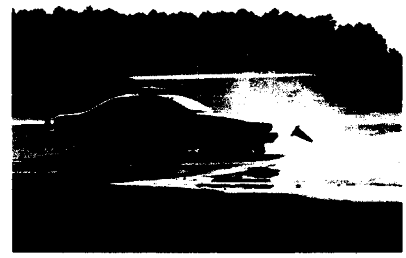
	Indoor range avg. side 25ft bullet trap	Average	54.3	Fast	54.3
Indoor range					
	Indoor range 25 ft side bullet trap ext.	Average Acc.	71.4	Fast	76.3
	Indoor range outside avg. acc. bullet trap		79.2	Fast	
	Indoor range avg. acc. bullet trap ext. 25ft		78.4	Fast	
	Indoor range exterior ambient, insects	Ambient	50.1	Fast	50.1
	Indoor range exterior avg. acc. gunshots	Average Acc.	60	Fast	60.0
	Indoor range exterior pk. acc. gunshots	Peak Acc.	68.9	Peak	68.9
	Indoor range external driveway gun shots	Average	53.3	Fast	53.3
	Indoor range across street ambient quiet	Ambient	49	Fast	47.3
	Indoor range edge of road quiet ambient		45.5	Fast	
	Indoor range edge of road, gunshots	Average	48	Fast	47.4
	Indoor range across street guns		46.8	Fast	
	Indoor range avg. acc. edge of road, gunshots	Average Acc.	50.2	Fast	50.6
	metal Indoor range avg. acc. across street		51	Fast	

APPENDIX B:

SUMMARIES OF THE SOUND PROPAGATION EXPERIMENTS CONDUCTED AT FLETC BRUNSWICK

RANGE 4 AND RANGE 5: SKID PAD

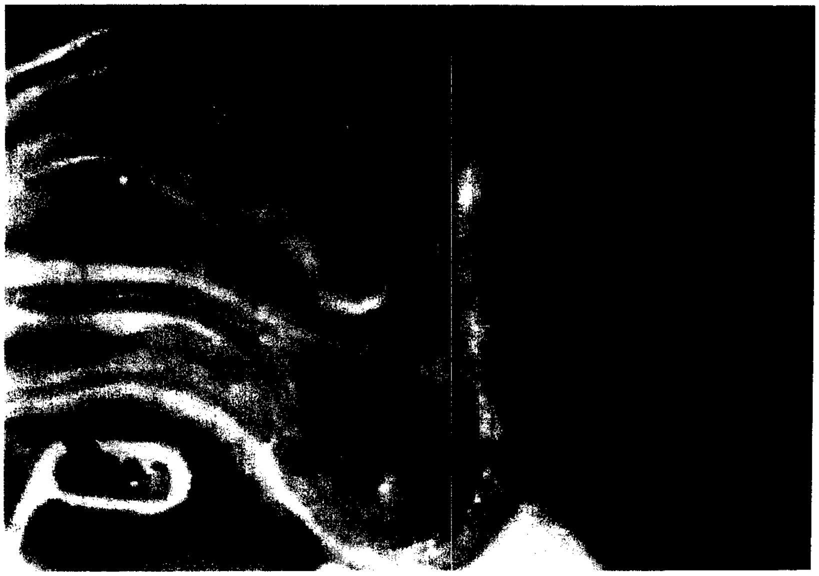


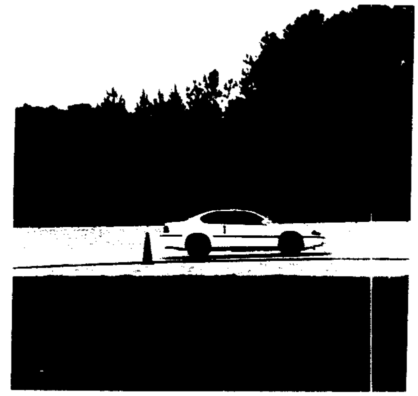


During training activities on the Skid Pad, officers engage in classroom instruction and then drive to the Skid Pad. They form a line and each officer in turn accelerates his or her vehicle, makes a 90° turn into the Skid Pad from the access road and accelerates up to speed. The officer then hits the brakes to stop, and makes a bootleg turn or a J-turn. The duration of the skid and the noise associated with it is approximately 5 to 10 seconds depending upon which turn is executed. Training on a wet skid pad produces less noise then when officers skid from the wet pavement to the dry pavement. Peak sound levels produced as vehicles skid were among the highest sound levels measured for the driving training events. There are gaps between each officer's skid run as the next officer waits for the track to be cleared. After each officer has practiced the exercise, the class will either discuss the activities on their radios as the cars idle or students will park their cars and move to the bleachers for class discussion as they prepare for the next training event. Range 4 measurements were taken from a location approximately 30 ft in front of the shelter. It was approximately 140 ft to 160 ft to the ends of the skid from this location with an average distance of 105 ft to the driving lane in the center of the skid path. Range 5 measurements were taken approximately 79 ft from start line.


75 dBA
86 dBA

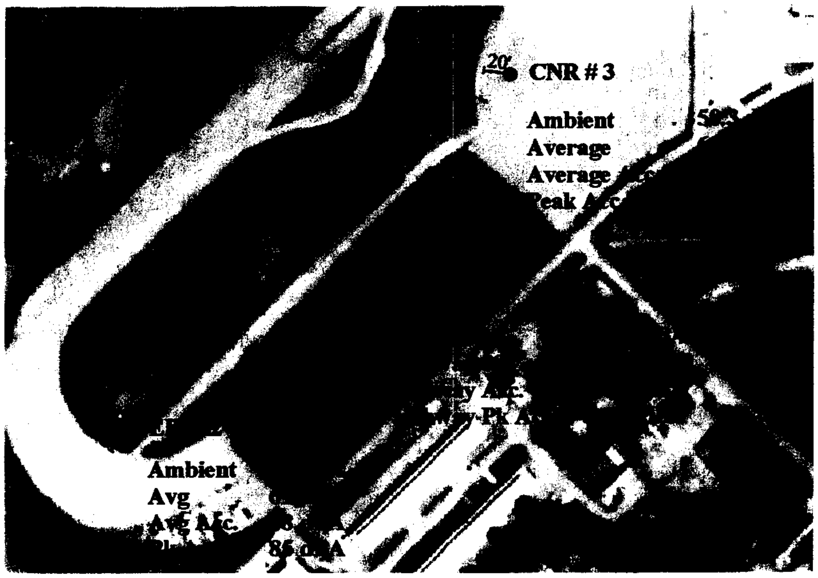
RANGE 9: URBAN RESPONSE RANGE





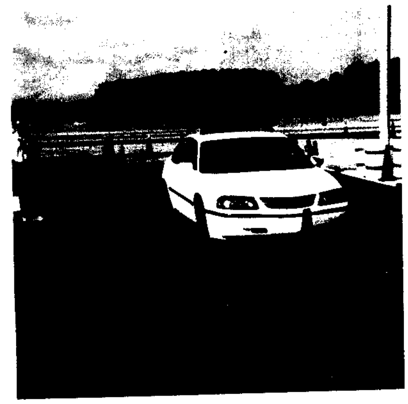
Training on the Urban Response Range consists of high speed driving on a course with very sharp turns. The highest level sounds occur during braking and acceleration as officers move through the tight turns. Short duration, transient sounds as cars rapidly slow down and then accelerate through the tight turns are among the loudest sounds measured for the larger driving tracks. Cars follow each other with significant pauses between vehicles entering the curves for safety purposes. The sounds measured as vehicles move through the curves are followed by pauses when the sound level returns to the ambient as the next car approaches. A part of each class is used for formal instruction either in a classroom before officers drive to the range or for instruction in the outdoor structures adjacent to the track. Data were taken from one of the instructor's observation platforms approximately 25 feet from the curve.

RANGE 7: EMERGENCY RESPONSE RANGE



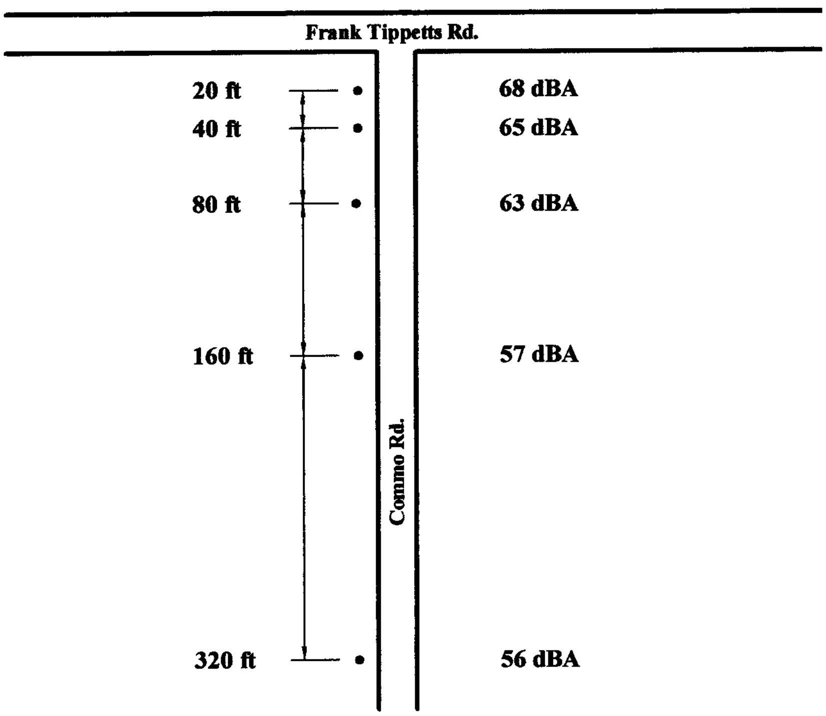
The Emergency Response Range is a long track with several turns where officers practice high speed driving. Average sound levels produced on the straightaways are similar to normal light traffic sounds. Louder sounds are produced when officers slow down, move through a turn or corner and then accelerate as they move through the turn. Cars follow each other with significant pauses between vehicles entering the curves for safety purposes. The sounds measured as vehicles move through the curves are followed by pauses when the sound level returns to the ambient as the next car approaches. Measurements were taken at 25 feet from Corner 3 (CNR #3), 135 feet off the long straightaway (ER M1) and at 60 feet from the long curve at the end of the track (ER M2).

RANGE 3: NON EMERGENCY VEHICLE OPERATION (NEVO)



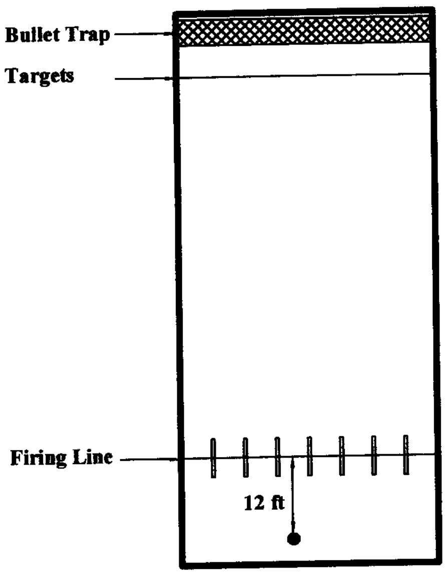
There are a series of 5 NEVO Skill Pads for training in driving skills required in tight urban environments. These include backing up between narrowing lanes formed by cones, driving forward and then reversing through narrow lanes, and a stopping and starting exercise. Acoustical measurements were made in Ranges 1, 2, 3 and 5. These are relatively quiet activities compared to the Skid Pads and the Urban Response Range. The back up warning signal was among the loudest sounds produced at this track.

M4: DISTANCE EXPERIMENT (SOUND DECAY WITH DISTANCE DOWN A HILL)



This experiment was constructed to verify actual sound decay with distance from automobile noise down a narrow roadway lined with trees. The average sound decay with distance is less than the 4-5dB per doubling of distance usually estimated. The sound levels at 320 ft approach the ambient noise level at this location.

INDOOR FIRING RANGE (INSIDE MEASUREMENT)



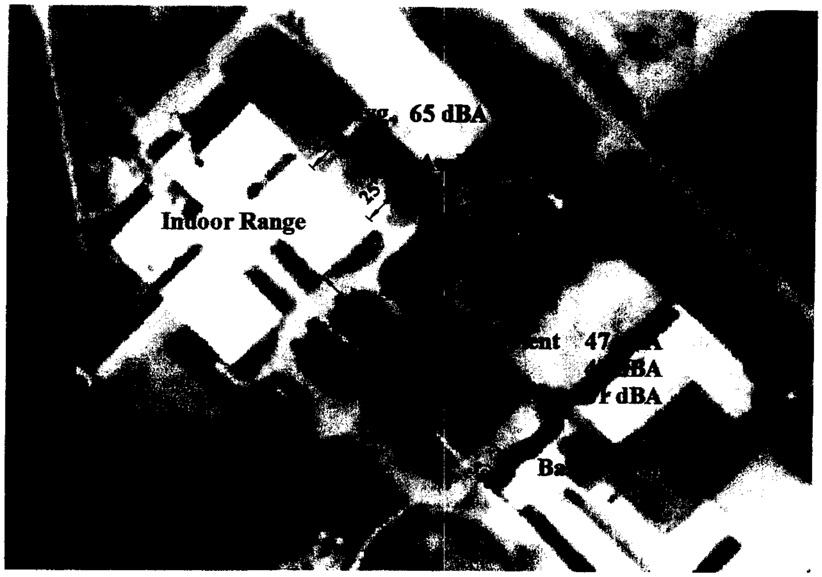
Existing Indoor Firing Range
FLETC Brunswick

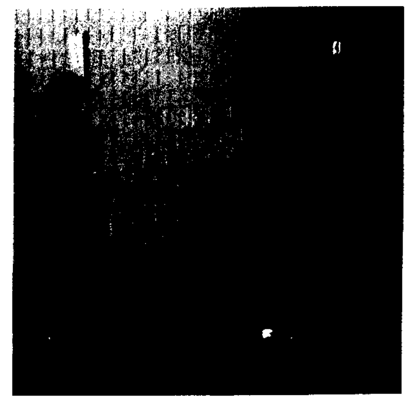
Inside of Range

Ambient	**61 dBA**
Avg. (p/a+vent)	**84 dBA**
Avg. (gunshot)	**119 dBA**
Pk. Acc.	**139 dBA**

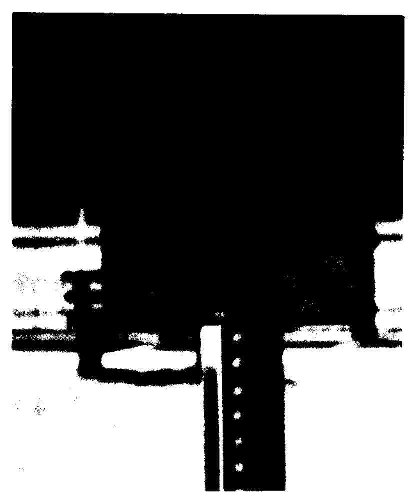
Data were recorded at 12 ft. behind the firing line inside the existing indoor firing ranges to understand the loudness of sounds within the fully enclosed ranges. Eight officers were firing in each of 2 connected ranges. The exercise observed involved the use of 9 mm. handguns from a variety of lying positions.

INDOOR FIRING RANGE (OUTSIDE MEASUREMENTS)





Measurements were taken at 25 ft from the bullet trap and 25 ft from the ventilation fan on the side of the building. Measurements were also taken at 30 ft from the front of the building in the parking lot, at 150 ft from the building at the edge of the street and at the front of the building across the street approximately 380 ft from the front of the range. At the bullet trap and ventilation fan locations, the gunshots were plainly audible and relatively loud. At the front of the building, the gunshots were reduced substantially in loudness, but were somewhat audible above the background noise. At the edge of the street, the gunshots form the indoor range were difficult to hear. At the face of the building across the street, the gunshots were not audible or measurable above the ambient sounds. The ranges are constructed of double concrete walls and roofs that reduce significant amounts of sound as it passes from inside to outside.



APPENDIX C:

DATA SUMMARY OF ACOUSTICAL MEASUREMENTS IN AND AROUND THE PROPOSED FLETC CHELTENHAM SITE

M1	Location	dBA	
	M1 Wood Chipper	65.3	Fast
	M1 Lawn mower and crickets	60.1	Fast
	M1 Crickets	57.4	Fast
	M1 Ambient, crickets	50.8	Fast
	M1 Dogs barking	48.5	Fast
	M1 Plane in distance	48.1	Fast
M3			
	M3 Quiet jet in distance, insects, nailing	55.8	Fast
	M3 Construction in distance, plane in distance	54.7	Fast
	M3 Prop. plane in distance, insects, light nailing	52.2	Fast
	M3 Nailing in distance, insects, backup beep	51.9	Fast
M4			
	M4 Truck passes 25 ft from road	74.1	Fast
	M4 Dump truck passes at 25ft	73.8	Fast
	M4 Car with bass passes	71	Fast
	M4 School bus starts 40 ft to 150 ft	70.6	Fast
	M4 40 ft cars pass + car on condo	69	Fast
	M4 20 ft school bus passes	68.8	Fast
	M4 20 ft 1 truck passes small	65.9	Fast
	M4 Spread out cars pass 20 ft	65	Fast
	M4 Cars and crickets	64.8	Fast
	M4 Cars pass 40 ft	64.5	Fast
	M4 40ft from road cars pass	64.4	Fast
	M4 80ft from road large truck passing	64.4	Fast
	M4 80ft from road cars & trucks pass	63.3	Fast
	M4 People talking, cars	63.1	Fast
	M4 Car passes w insects	62.8	Fast
	M4 40 ft from road cars pass	62.6	Fast
	M4 80 ft cars pass on Tippett	61.7	Fast
	M4 80 ft 2 cars pass on Tippett	61.4	Fast
	M4 Car passes w plane lawnmower	61.2	Fast
	M4 Truck passes at 320ft insects	60.6	Fast
	M4 Crickets w car in background	59.5	Fast
	M4 160ft from road, school bus passes	58.4	Fast
	M4 Plane in dist 1 car passes 160 ft	58	Fast
	M4 Car passes at 160 ft	58	Fast
	M4 Lawnmower at 350 ft no cars	57.4	Fast
	M4 160ft Cars pass, dog bark, insects	57.2	Fast
	M4 160ft From road, fighter plane overhead	57.1	Fast
	M4 40 ft School bus stops at 150 ft	56.5	Fast
	M4 320ft Cars pass, school bus loud insects	56.2	Fast
	M4 320ft Large trucks and van pass	56.2	Fast
	M4 320ft Cars pass	56.1	Fast
	M4 Lawnmower at 350ft, insects no cars	55.7	Fast
	M4 Car passes at 320ft, insects	55.6	Fast
	M4 Quiet lull insects plane in distance	54.8	Fast

	M4 Truck in distance insects	53.8	Fast
	M4 80ft from road relative quiet with light traffic	53.5	Fast
	M4 Plane cars background	48.9	Fast
M6			
	M6 Ambient noise	47.9	Fast
	M6 Yard work	46.9	Fast
M9			
	M9 Cars passing with Plane in background	52.9	Fast
	M9 Ambient noise cars in distance	51.7	Fast
	M9 Car passes	50.4	Fast
M10			
	M10 Truck passes and cars	63.7	Fast
	M10 Garbage truck at 200 ft	63.5	Fast
	M10 Small plane flies overhead	61.3	Fast
	M10 Air plane, car and insects	54.5	Fast
	M10 Plane and voices, ambient	49.1	Fast
M12			
	M12 Cars passing	64.6	Fast
	M12 Light traffic	59	Fast
	M12 Cars passes	58.9	Fast
M13			
	M13 Dump truck passes	70.5	Fast
	M13 Semi and school bus	67.5	Fast
	M13 Cars pass	66.7	Fast
	M13 Cars pass	65.6	Fast
M14			
	M14 Car passes	70.5	Fast
	M14 Car passes w/ crickets	59.5	Fast
	M14 Crickets chirping	56.3	Fast
	M14 Crickets in background w cars from	50.1	Fast
	M14 Crickets and car in background	48.4	Fast
	M14 Plane in distance	47.7	Fast
	M14 Insects and AC Unit	45.4	Fast
M15			
	M15 Plane passes over head	61.6	Fast
	M15 Ambient noise, plane in distance	44.7	Fast
M16			
	M16A School Bus	66.7	Fast
	M16 Truck traffic	51.8	Fast
	M16 Ambient noise	46.1	Fast
	M16 Basketball, plane in background	45.4	Fast
M17			
	M17 Car passes	56.3	Fast
	M17 Weed wacker	50.8	Fast
M18			
	M18 Ambient noise	47	Fast
	M18 Car passes	53.8	Fast
M19			

	M19 Car passes	65.7	Fast
	M19 Dog barking	59.6	Fast
	M19A Lawn mower from side walk	58.6	Fast
	M19 Tractor 3 houses away	56.6	Fast
M19			
	M19 Dog and plane, talking	49.9	Fast
	M19 No noise	47.5	Fast
M20			
	M20 Cars passing	62	Fast
	M20 Cars on Rt 5, plane nearby	60.5	Fast
	M20 Crickets, plane in distance, cars on Rt 5	59.5	Fast
	M20 Cars on Rt 5 ambulance in distance	59.1	Fast
	M20 Cars in distance Rt 5	55.2	Fast
M21			
	M21 Crickets and car background	70.9	Fast
	M21 Car passing	64.1	Fast
	M21 Ambient noise	53	Fast
	M21 Cars on Rt 5 Insects	47.6	Fast
M22			
	M22 Cars on highway	65.2	Fast
	M22 Kids screaming	64.6	Fast
	M22 Car passing insects	61.7	Fast
	M22 Car passes	56.1	Fast
	M22 Insects and cars on Rt 5	50.8	Fast
	M22 Car on Rt 5 insects	50.6	Fast
	M22 Insects home ac units	49.2	Fast
	M22 Ambient noise	46.7	Fast
M23			
	M23 Car passing R t5 background	71.1	Fast
	M23 Trucks and cars Rt 5	68.2	Fast
	M23 Cars on Rt 5	66.5	Fast
M24			
	M24 Birds and cars on Rt 5	69.8	Fast
	M24 Ambulance, cars, and plane	67.9	Fast
	M24 Heavy traffic and birds	66.5	Fast
	M24 Cars on RT5	61.3	Fast
	M24 Light traffic, birds	57.9	Fast
M25			
	M25 Car passing	69.8	Fast
	M25 Yard workers	66.7	Fast
	M25 Yard workers and car passes	63.4	Fast
	M25 Plane cars on road plane in distance	61.7	Fast
	M25 Car passing	61.5	Fast
M26			
	M26 Crickets in background	54.4	Fast
	M26 Cars and crickets in background	46.2	Fast
	M26 Crickets in background	54.4	Fast
	M26 Cars and crickets in background	46.2	Fast

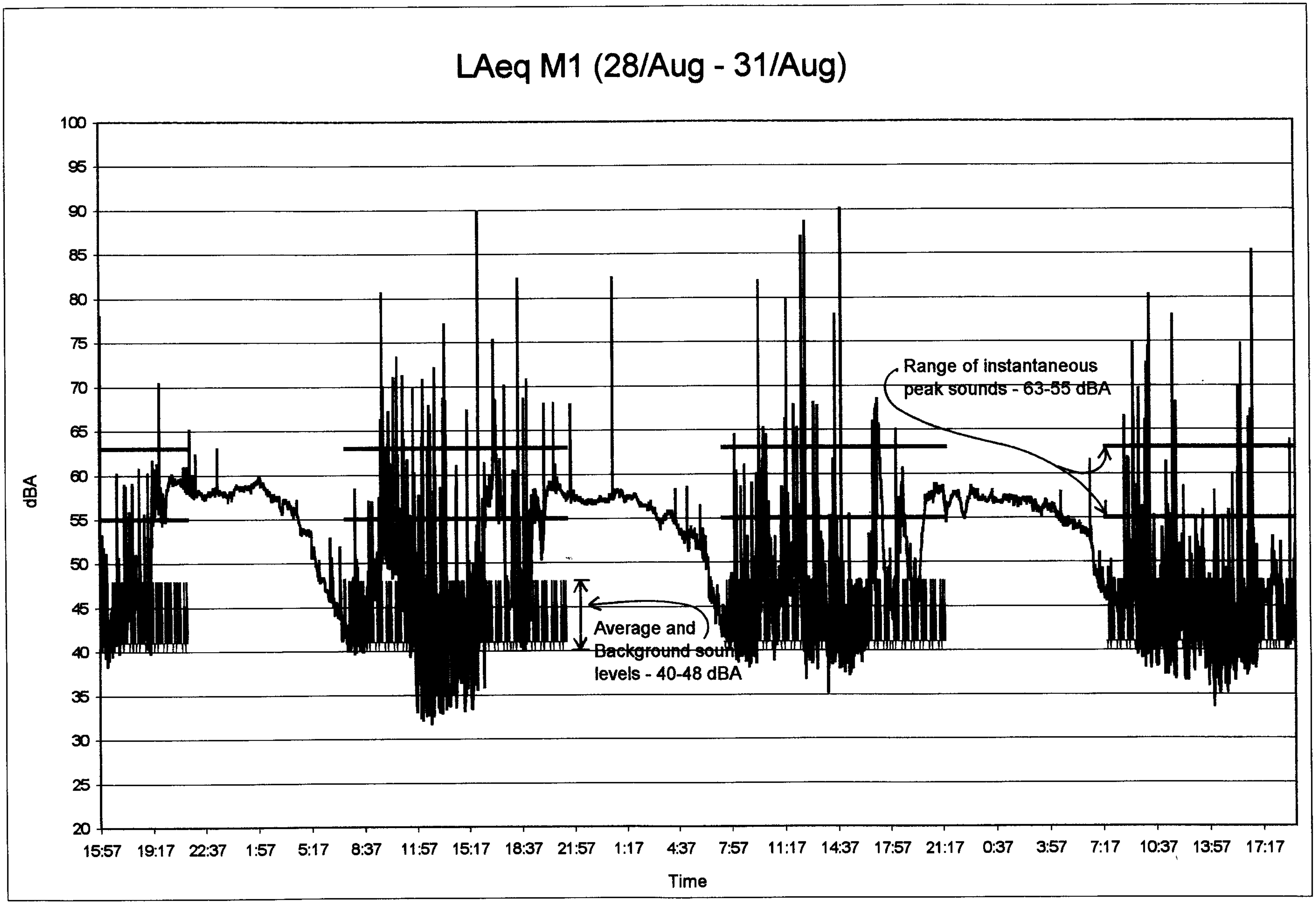
M28			
	M28 Motorcycle in distance	53.7	Fast
	M28 Car in background and AC	52.3	Fast
	M28 Motor cycle in distance and voices	51.6	Fast
	M28 Fox chopper in distance	48.6	Fast
M28			
	M28 Plane in distance, bird	47.3	Fast
	M28 Fox park ambient, siren in distance	46	Fast
M31			
	m31 Tow truck	76.4	Fast
	M31 Bakery truck passes	69.4	Fast
	m31 Jet plane in distance	68	Fast
	m31 Small plane	66.4	Fast
	M31 2 Large bans	66.3	Fast
	M31 1 Large truck, 2 cars pass, crickets	63.2	Fast
	M31 Plane	62.9	Fast
	M31 Plane close by cars in distance	61.1	Fast
	M31 Car passes	59.7	Fast
	M31 Traffic	56.4	Fast
	M31 Car passes and airplane	52.9	Fast
	M31 Light traffic	52.3	Fast
	M31 People talking	51.6	Fast
	M31 Ambient, insects, AC, car approach	51.5	Fast
	M31 Ambient	51.1	Fast
	M31 Ambient noise	50.2	Fast
	M31 No cars	48.8	Fast
	M31 Birds, AC unit, and crickets	48	Fast
M32			
	M32 Plane and car in background	49.7	Fast
	M32 Quite ambient	46.9	Fast
M34			
	M34 Car passes	61	Fast
	M34 Distant traffic	53.1	Fast
M35			
	M35 Traffic, bird, bug	69.1	Fast
	M35 Cars on highway people voices	65.9	Fast
	M35 Cars trucks on highway	65.5	Fast
	M35 Few traffic, bird, bug	61.1	Fast
	M35 Traffic from road and the berm	61	Fast
	M35 Rare traffic, bird	59.3	Fast
	M35 Bottom of berm traffic, crickets	56.6	Fast
	M35 Cars on highway, plane overhead	53.5	Fast
	M35 Cars in background	48.9	Fast
M36			
	M36 Ambulance	86.6	Fast
	M36 Plane and air conditioner	47.7	Fast
M37			
	M37 Car passes	65.5	Fast
	M37A Cars pass	62.1	Fast

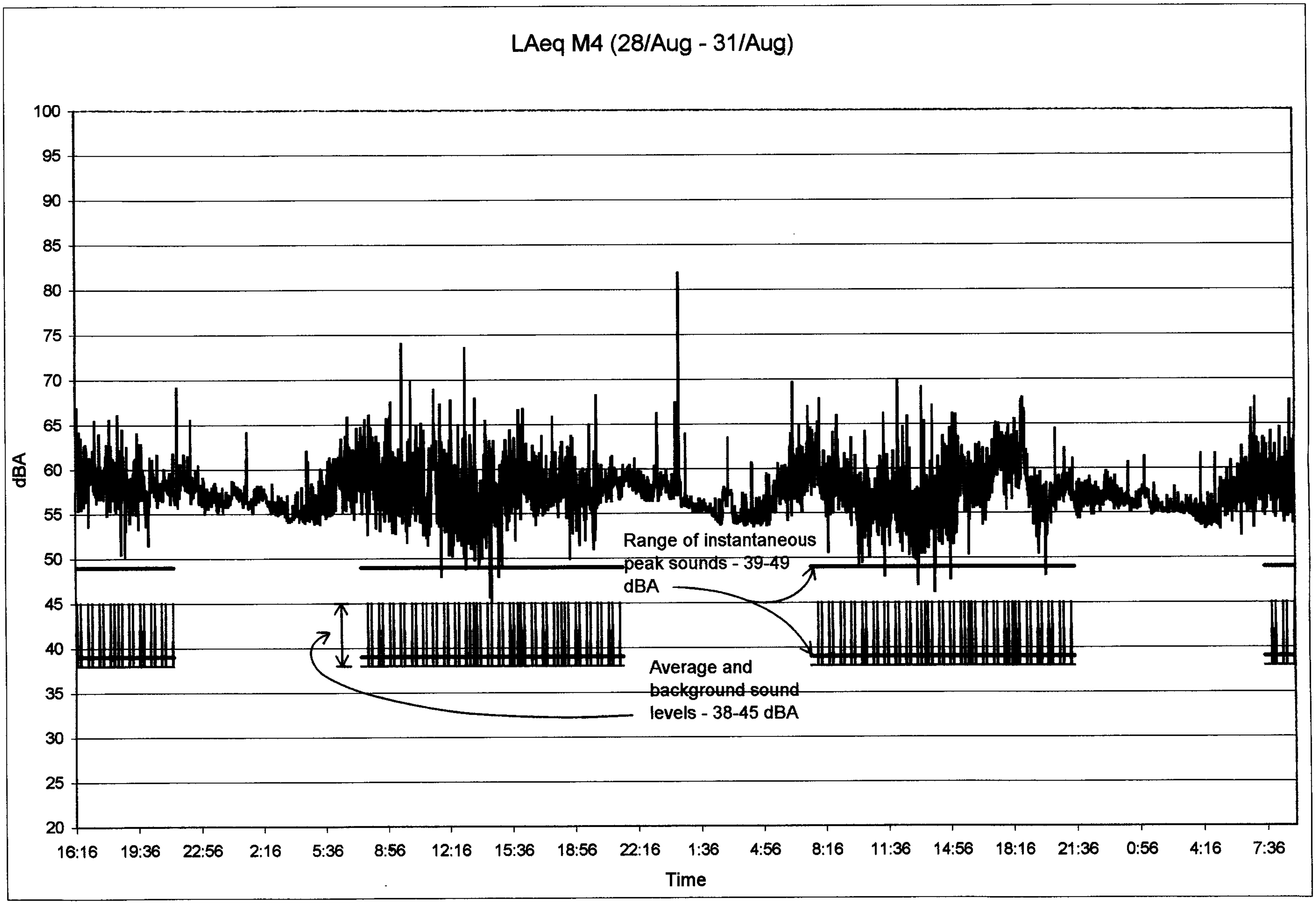
	M37 Weedwacker	59.8	Fast
	M37A Distance traffic	52.5	Fast
M40			
	M40 Generator, bird	57.3	Fast
	M40 People in distance	53	Fast
M40			
	M40 Plane in distance and voices	50.3	Fast
	M40 Lawn mower and people talking	49	Fast
M41			
	M41 Chopper, plane in distance	57.4	Fast
	M41 Plane in distance	57.3	Fast
	M41 Car passes	52.9	Fast
	M41 Kids playing, trees moving	51.4	Fast
	M41 Air plane in dist	49.8	Fast
	M41 Trees in wind	49.2	Fast
	M41 Lawn mover and cars in distance	49.1	Fast
	M41 No traffic, airplane in distance	43.9	Fast
M42			
	M42 Traffic Rt 5,stuart	62.2	Fast
	M42 Traffic from Rt 5	58.2	Fast
	M42 Traffic Rt 5, plane in distance	57.5	Fast
GRAVEL			
	GRAVEL road loud motorcycle	72.8	Fast
	GRAVEL road, traffic	68.7	Fast
M9			
	RICA FAC 120 ft 1 car passes, radio in distance	54.2	Fast
	RICA FAC ambient, radio in distance, insects	47.4	Fast
M43			
	Big log loud car	76.7	Fast
	Big log steady traffic	75.7	Fast
	Big log cars passing	71.3	Fast
	Big log ambient car approaching	51.3	Fast
	Big log ambient relatively quiet	50.6	Fast
	Big log very quiet ambient, birds, insect	48.1	Fast
M30			
	Surratt & Tippett 3 cars pass on Tippett 20ft	72.3	Fast
	711 Surratt ambient noise	65.3	Fast
	Surratt 6 Tippett 20 ft cars turn on Surratt	64.8	Fast
	711 Surratt car with bass	64.6	Fast
	Surratt & Tippett cars turn on Surratt	64	Fast
	711 Surratt cars from Rt 5	60	Fast
	Surratt & Tippett cars in distance, insects	55.7	Fast
	Surratt & Tippett lull in traffic, insects	55.6	Fast
M42			
	Summit creek traffic & dump truck	76.5	Fast
	Summit creek traffic & loud truck	70	Fast
	Quiet ambient on rd by summit, car approach	50.2	Fast
M31			
	By y in road, traffic w/ 2 big trucks	72.9	Fast

	Y in road steady car traffic	72.2	Fast
	Y in road car traffic	69.1	Fast
	Y in road, car traffic	64.3	Fast
M11			
	Fire school jet plane takes off in distance	60.1	Fast
	Fire school quiet ambient, insects, birds	51.4	Fast
M11			
	Fire school quiet insects birds	51.2	Fast
	Fire school insects, voice on radio 150ft	50.7	Fast

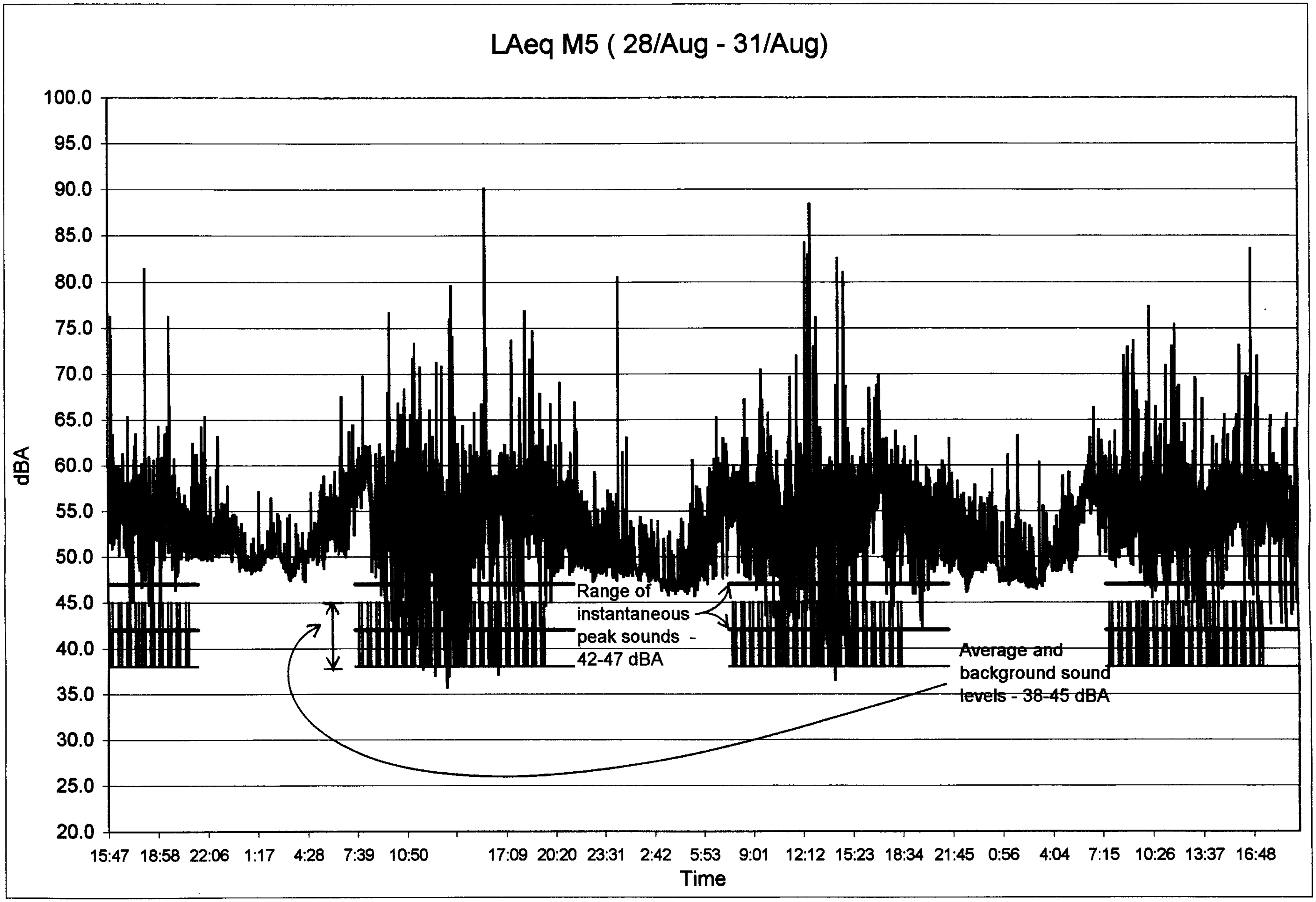
APPENDIX D:

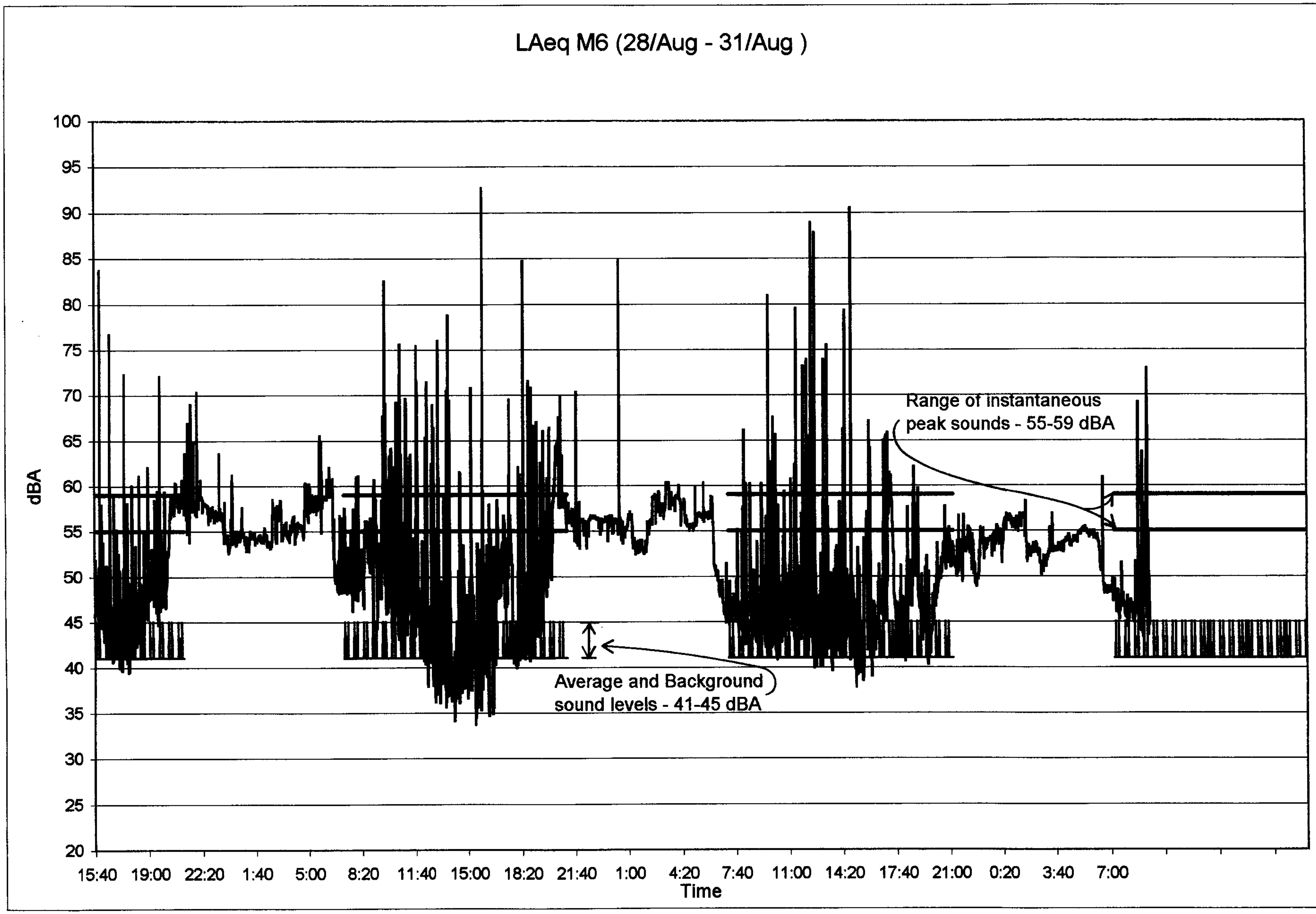
GRAPHS OF LONG TERM SOUND LEVELS FOR LOCATIONS AROUND THE FLETC CHELTENHAM SITE WITH PROJECTED AVERAGE AND PEAK SOUND LEVELS FROM TRAINING ACTIVITIES

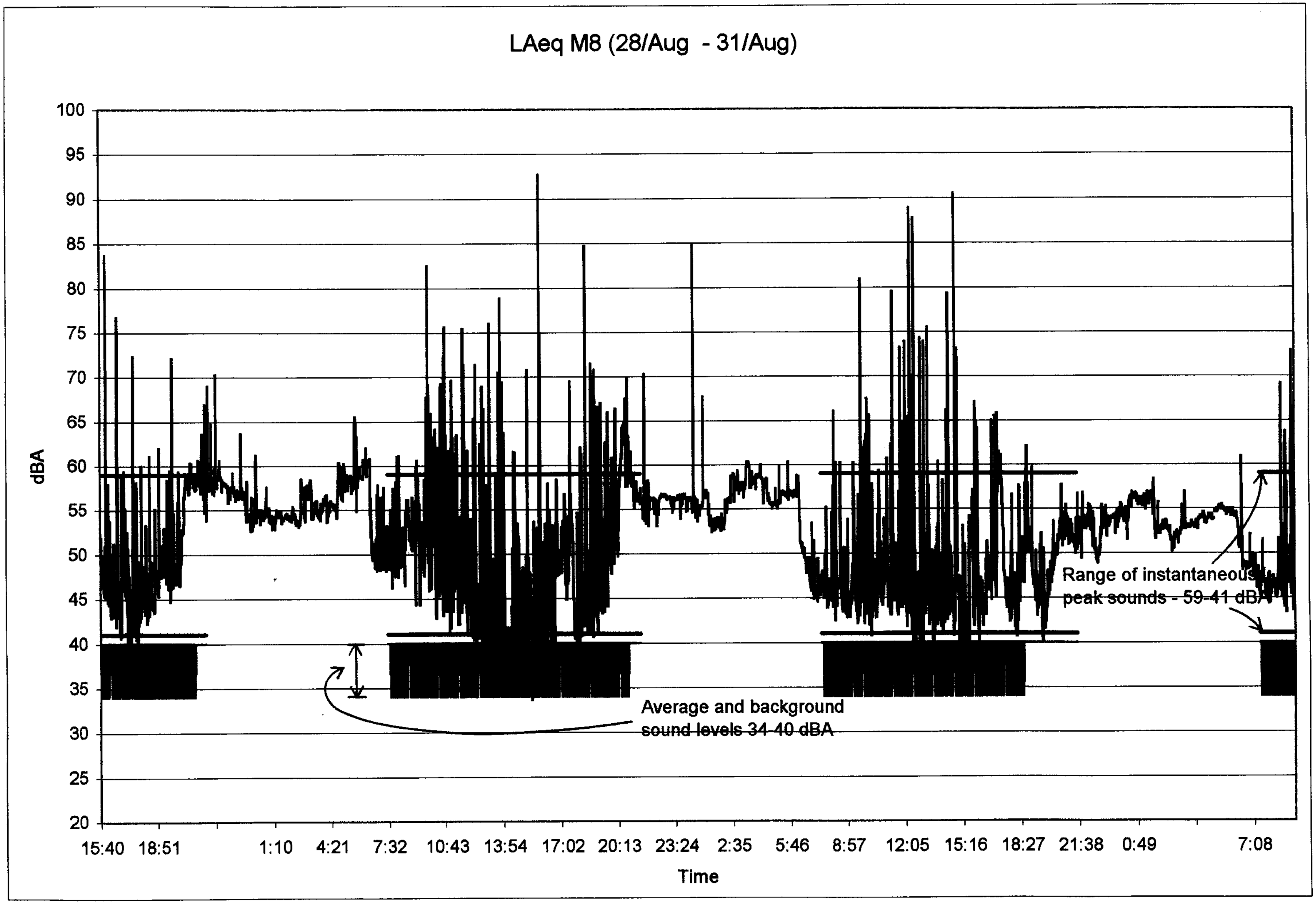

LAeq M1 (28/Aug - 31/Aug)
dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15:57
19:17
22:37
1:57
5:17
8:37
11:57
15:17
18:37
21:57
1:17
4:37
7:57
11:17
14:37
17:57
21:17
0:37
3:57
7:17
10:37
13:57
17:17
Time
Range of instantaneous peak sounds - 63-55 dBA
Average and Background soun levels - 40-48 dBA



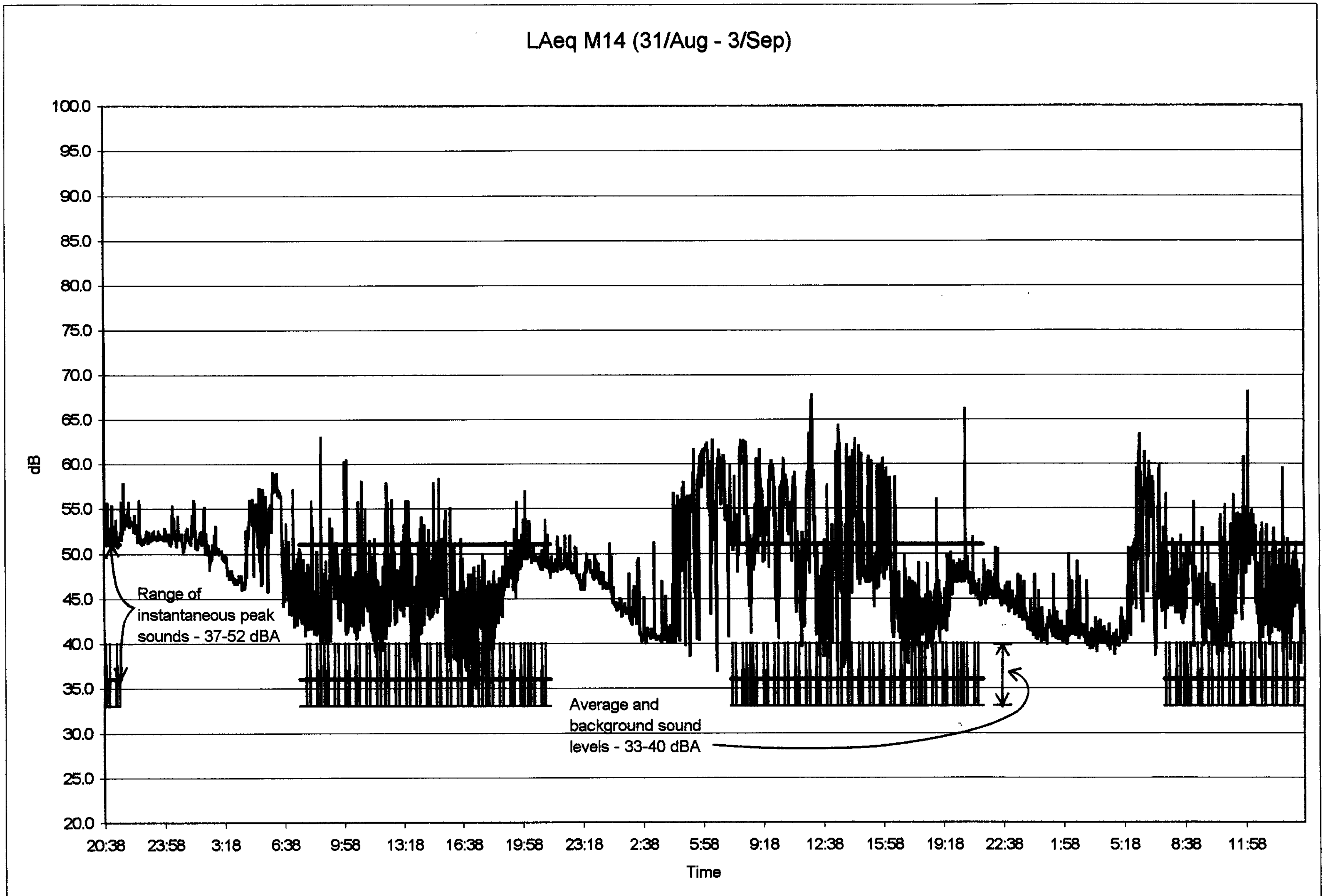
LAeq M4 (28/Aug - 31/Aug)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
dBA
16:16
19:36
22:56
2:16
5:36
8:56
12:16
15:36
18:56
22:16
1:36
4:56
8:16
11:36
14:56
18:16
21:36
0:56
4:16
7:36
Time
Range of instantaneous peak sounds - 39-49 dBA
Average and background sound levels - 38-45 dBA


LAeq M5 (28/Aug - 31/Aug)
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
dBA
Range of instantaneous peak sounds - 42-47 dBA
Average and background sound levels - 38-45 dBA
15:47 18:58 22:06 1:17 4:28 7:39 10:50 17:09 20:20 23:31 2:42 5:53 9:01 12:12 15:23 18:34 21:45 0:56 4:04 7:15 10:26 13:37 16:48
Time

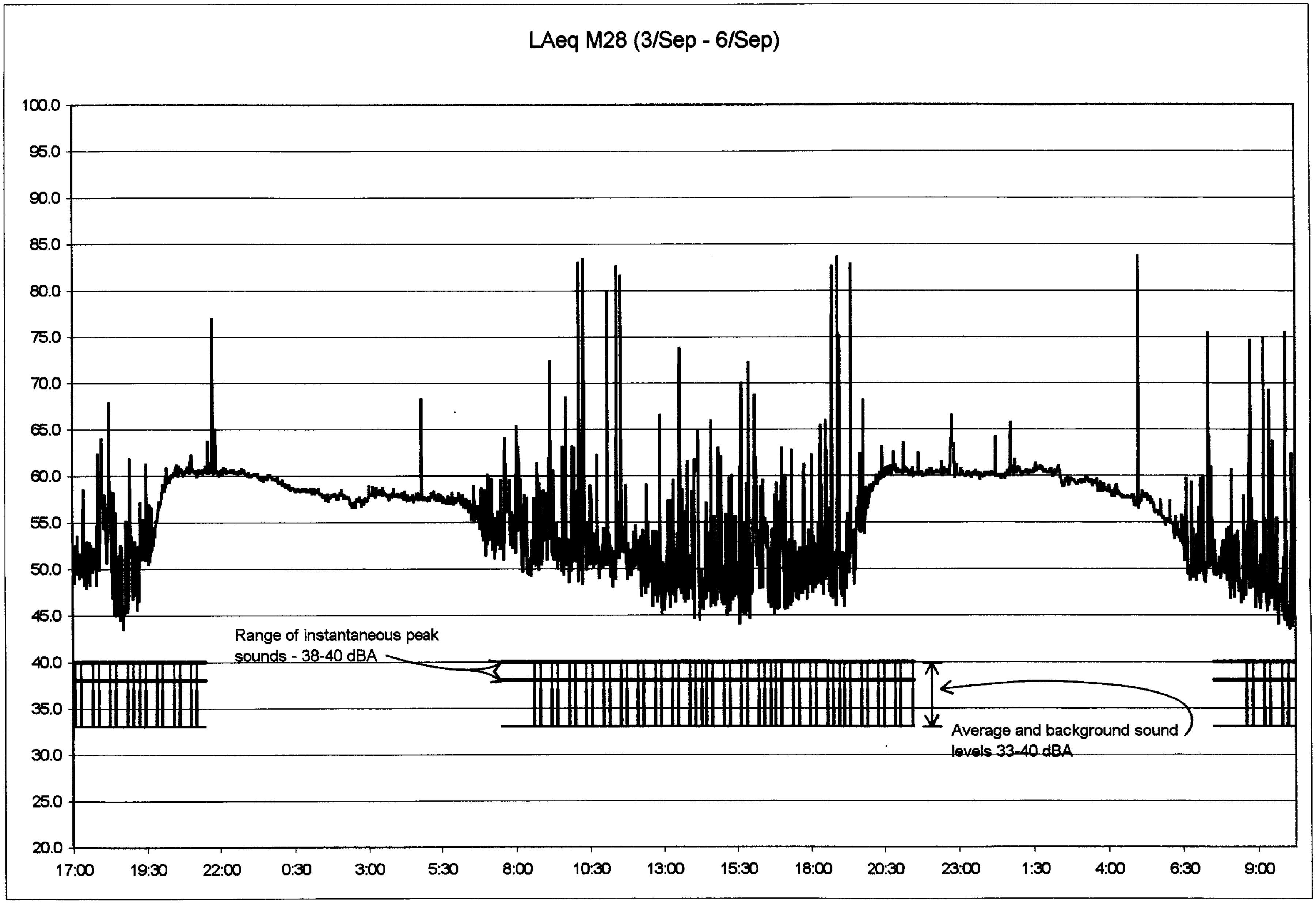

LAeq M6 (28/Aug - 31/Aug)
dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15:40
19:00
22:20
1:40
5:00
8:20
11:40
15:00
18:20
21:40
1:00
4:20
7:40
11:00
14:20
17:40
21:00
0:20
3:40
7:00
Time
Range of instantaneous
peak sounds - 55-59 dBA
Average and Background
sound levels - 41-45 dBA

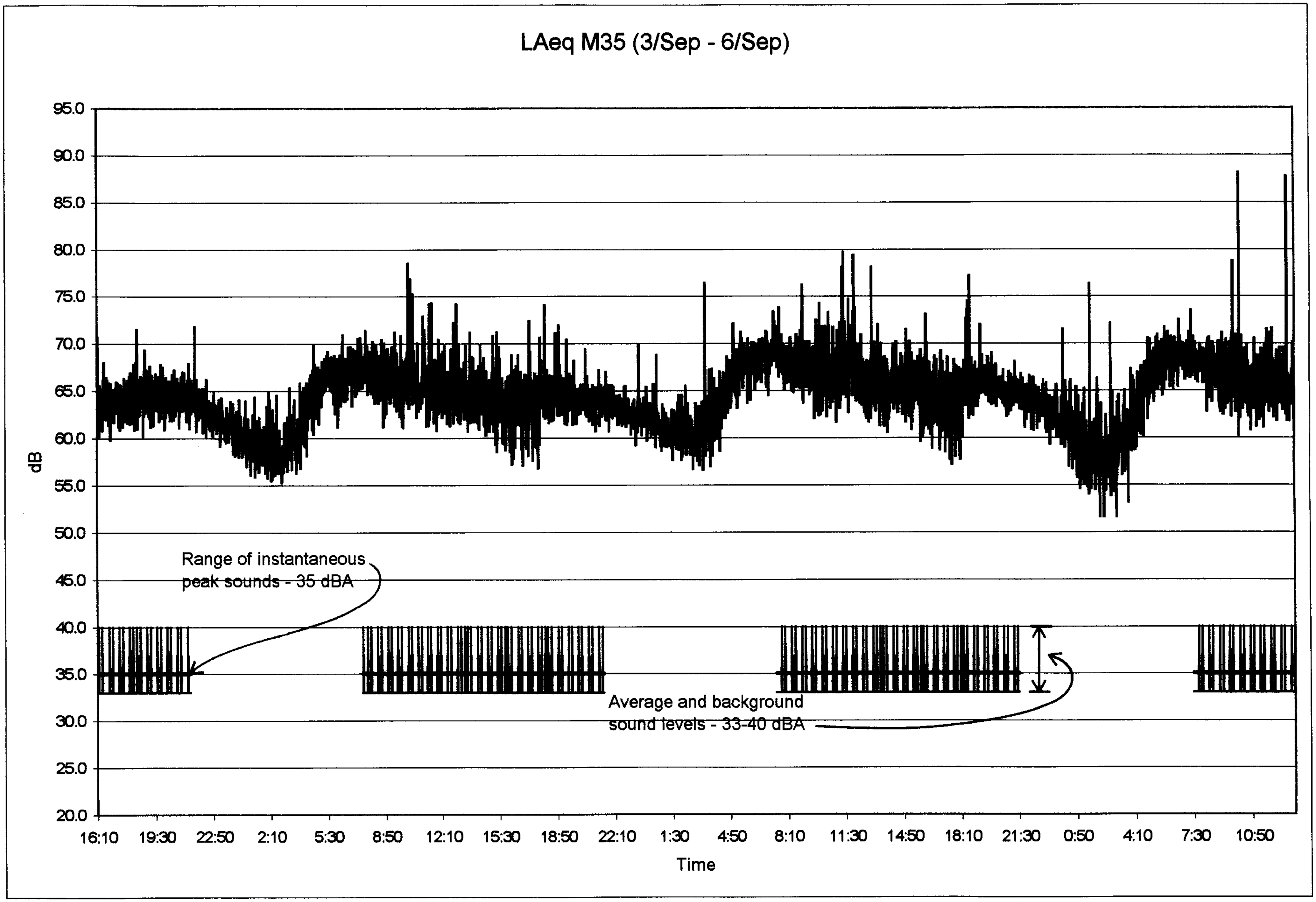


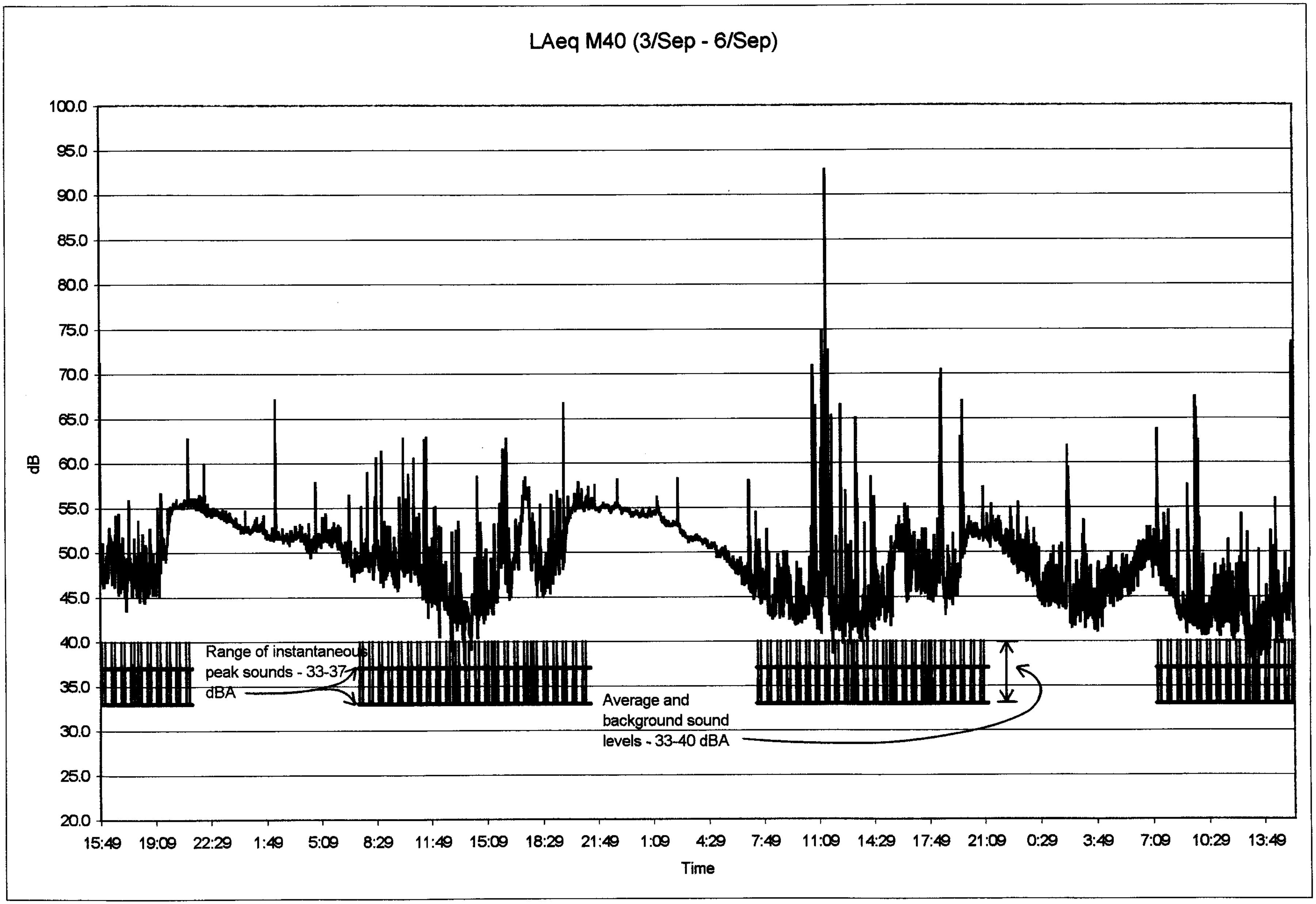
LAeq M8 (28/Aug - 31/Aug)
dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15:40
18:51
1:10
4:21
7:32
10:43
13:54
17:02
20:13
23:24
2:35
5:46
8:57
12:05
15:16
18:27
21:38
0:49
7:08
Time
Range of instantaneous peak sounds - 59-41 dBA
Average and background sound levels 34-40 dBA



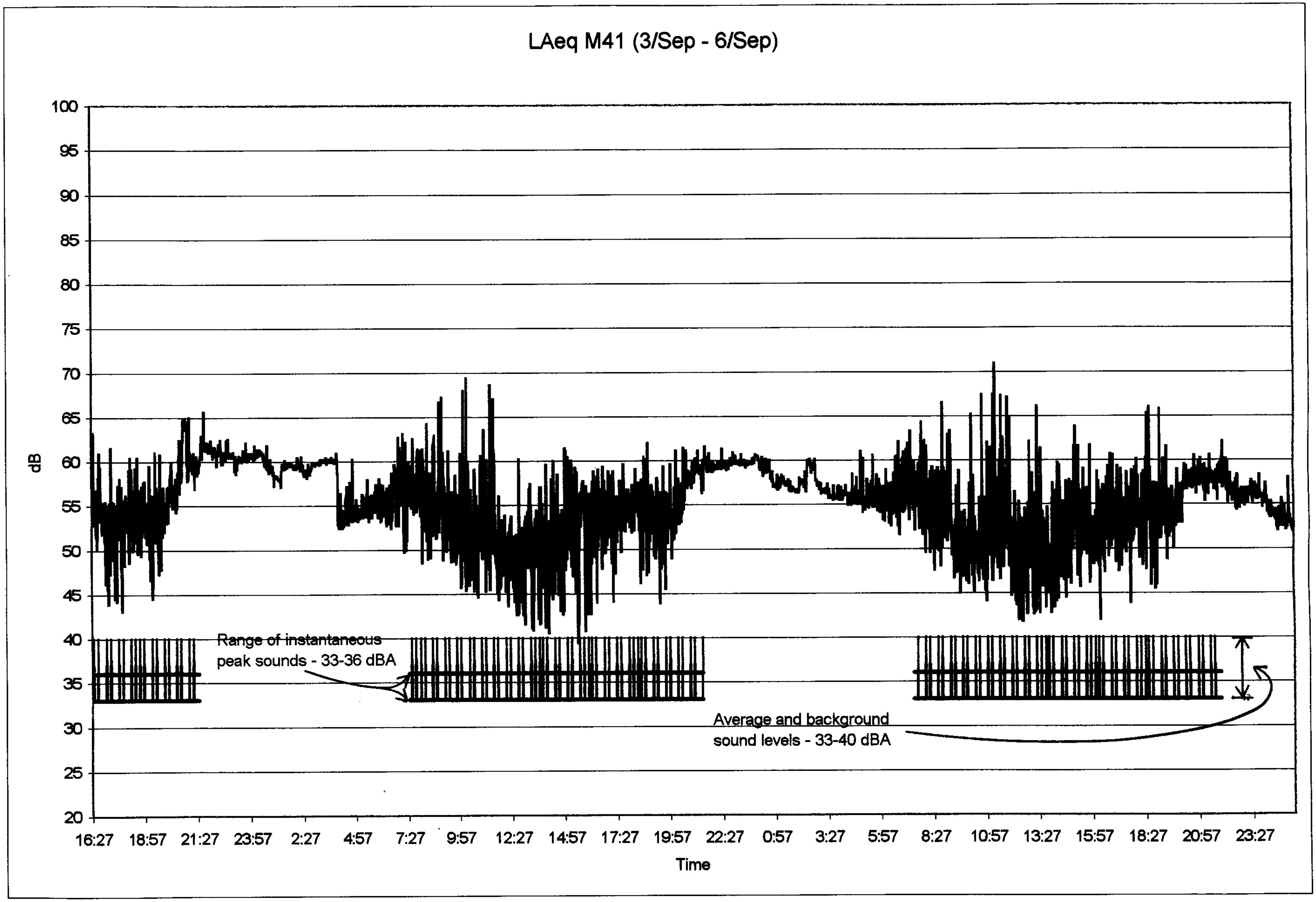
LAeq M14 (31/Aug - 3/Sep)
dB
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
Range of
instantaneous peak
sounds - 37-52 dBA
Average and
background sound
levels - 33-40 dBA
20:38
23:58
3:18
6:38
9:58
13:18
16:38
19:58
23:18
2:38
5:58
9:18
12:38
15:58
19:18
22:38
1:58
5:18
8:38
11:58
Time


LAeq M28 (3/Sep - 6/Sep)
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
17:00
19:30
22:00
0:30
3:00
5:30
8:00
10:30
13:00
15:30
18:00
20:30
23:00
1:30
4:00
6:30
9:00
Range of instantaneous peak sounds - 38-40 dBA
Average and background sound levels 33-40 dBA


LAeq M35 (3/Sep - 6/Sep)
dB
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
Range of instantaneous peak sounds - 35 dBA
Average and background sound levels - 33-40 dBA
16:10
19:30
22:50
2:10
5:30
8:50
12:10
15:30
18:50
22:10
1:30
4:50
8:10
11:30
14:50
18:10
21:30
0:50
4:10
7:30
10:50
Time



LAeq M40 (3/Sep - 6/Sep)
dB
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15:49
19:09
22:29
1:49
5:09
8:29
11:49
15:09
18:29
21:49
1:09
4:29
7:49
11:09
14:29
17:49
21:09
0:29
3:49
7:09
10:29
13:49
Time
Range of instantaneous peak sounds - 33-37 dBA
Average and background sound levels - 33-40 dBA


LAeq M41 (3/Sep - 6/Sep)
dB
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
16:27 18:57 21:27 23:57 2:27 4:57 7:27 9:57 12:27 14:57 17:27 19:57 22:27 0:57 3:27 5:57 8:27 10:57 13:27 15:57 18:27 20:57 23:27
Time
Range of instantaneous peak sounds - 33-36 dBA
Average and background sound levels - 33-40 dBA